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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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The Oppau Explosion

IT is now possible to collect sufficient data to determine the probable cause of the recent disastrous explosion at the Badische Anilin and Soda Fabrik works at Oppau, and to indicate a possible explanation. It has usually been assumed that ammonium nitrate is a perfectly stable and inoffensive substance under all ordinary conditions of practical use, but it is nevertheless true that it may sometimes be caused to explode by very rapid heating or by using a suitable detonator, the products being nitrous oxide and water (see H. Brunsvig in *Chemische Encyklopædie*, vol. v., p. 119). This fact was well known to the Badische Company, for in April, 1918, Dr. Bosch, of that company, stated that they were producing a new fertiliser derived from ammonium nitrate, which, unlike ammonium nitrate, was neither hygroscopic nor explosive. The new substance was obtained either by double decomposition of ammonium nitrate with chlorides, as in English Patents 145,036 and 145,037, or by combination with an inert salt such as ammonium sulphate. These two products were named "Kaliammon-salpeter" and "Ammon-sulfat-salpeter" respectively. It is now established that it was the explosion of 4,500 tons of "Ammon-sulfat-salpeter" which caused the disaster at Oppau.

A report was recently issued by the Badische Company dealing with the chemical nature and properties of these substances and their bearing on the explosion (see *Chem. Zeit.*, 1921, *117*, 937). It appears that exhaustive experiments had been made by the company to determine whether these substances were capable of being warehoused and transported in large quantities, and they were perfectly satisfied with the results. Their experiments established that a mixture of 60 parts of ammonium nitrate and 40 parts of potassium (or sodium) chloride entered into a chemical reaction, producing a mixture of potassium nitrate and ammonium chloride. A mixture of equal weights of ammonium nitrate and sulphate produced a double salt $2\,NH_4NO_3.(NH_4)_2SO_4$, and this substance has been sold with a slight excess of the sulphate. Numerous tests of the explosive power of this mixture, with nitrate content up to 60 per cent., were made by the Trauzl method, but with negative results; in fact, when endeavouring to detonate the salt with fulminate of mercury, the explosion of the latter was less violent with the salt than it would be without it. The Badische Company were so confident of the safety of their new product that it was their custom to break up large masses of it by the aid of explosives. Unfortunately it will never be possible to discover what happened at Oppau immediately before the explosion, since none of those present in the buildings concerned have survived.

A possible explanation of the explosion is indicated by E. Hene in *Chem. Zeit.*, of October 6 (p. 965). He states that a slow rise of temperature has been observed in the salt when stored, and this may indicate a spontaneous decomposition. If the ammonium sulphate contained a small amount of free sulphuric acid, this may react with the nitrate and liberate nitric acid. Free nitric acid or its anhydride may react with ammonium sulphate, liberating sulphuric acid, nitrogen, and water, the reaction being exothermic. The cycle then recommences, the net result being an increase in the total amount of free acid at each cycle. These reactions would probably be facilitated by long storage and high internal pressure. If this explanation of the explosion is the correct one, the progressive decomposition could probably be prevented by adding an alkali such as sodium carbonate.

The problems raised by the explosion have caused considerable discussion in Germany as to whether it is advisable to proceed with the manufacture of ammonium nitrate as a fertiliser. One alternative, ammonium sulphate, would involve a large extension of sulphuric acid production, but this again raises the question of a sufficient supply of sulphur. The

Badische Company are stated to favour the manufacture of sodium nitrate, although this would involve modifications in their plant to produce the necessary soda.

Chemical Warfare: The U.S.A. Point of View

CLOSE upon Major Lefebure's book, noticed a fortnight ago, comes another on "Chemical Warfare" from the United States (McCraw Hill Book Company, pp. 445, 21s.). Its joint authors are Brigadier-General A. A. Fries, Chief of the Chemical Warfare Service, and Major C. J. West, of the National Research Council; and Major-General W. L. Sibert contributes a foreword. While the technical treatment of the subject is full and the writing, if we may say so, much nearer English standards of style than many American productions, the book is especially interesting and valuable as disclosing the American point of view, in many respects sharply in contrast with the official attitude over here. What strikes one at once is the gulf which separates the almost journalistic frankness of this volume from the impenetrable reserve of the British official mind. Here are three highly-placed officers in the U.S.A. Army almost apologising, not for the fullness of their disclosures, but for the fact that they cannot disclose everything. Though, with unconcealed reluctance, they admit that "secrecy must still be maintained about some of the facts and some of the new discoveries which are the property of the service," they remind us with some pride that their pages "contain many statements which were zealously guarded secrets two years ago." And this enlarged programme of publicity on the part of the Chief of the Service, they assert, "is being justified every day by the ever-increasing interest in this branch of warfare."

Another point of contrast with the British attitude is the completeness with which all the writers accept the brutal logic of war. "Men are nothing," declares Major-General Sibert, "in modern war unless they are equipped with the most effective devices for killing and maiming the enemy's soldiers," and "it is impossible to humanise the act of killing and maiming the enemy's soldiers." There is in such passages as the following a welcome absence of the illogical sentimentality often heard over here: "Chemical warfare is an agency that must not only be reckoned with by every civilized nation in the future, but is one which civilized nations should not hesitate to use. . . . . It is just as sportsmanlike to fight with chemical warfare materials as it is to fight with machine guns. The American is a pure sportsman and asks odds of no man. He does ask, though, that he be given a square deal. He is unwilling to agree not to use a powerful weapon of war when he knows that an outlaw nation would use it against him if that outlaw nation could achieve success by so doing. How much better it is to say to the world that we are going to use chemical warfare to the greatest extent possible in any future struggle." Their alternatives are war to the utmost or no war at all, and this hard logic may yet prove the best argument for peace.

Apart from these ethical and political aspects, the book gives a remarkably detailed and complete treatment of the chemical and military developments of gas warfare, and may be warmly welcomed as a contribution to the technical literature of the subject. The British reader will note with interest the reference to Admiral Lord Dundonald's proposals for the use of sulphur dioxide in the Crimean campaign—proposals which were communicated to Lord Palmerston but were piously turned down by two committees on the ground that though perfectly feasible and likely to produce the calculated effects, "those effects were so horrible that no honourable combatant could use the means required to produce them." Lord Dundonald's plan of 1855 was, in the judgment of one authority quoted, "improperly published in 1908" in "The Panmure Papers," and thus, it is asserted, the German learnt it and were able to practise it in 1915. So large a conclusion, however, will probably be accepted by most readers with reserve.

Pulverized Slate as a Filler

ON a previous occasion we referred to the utilization of the waste material which is produced in considerable quantities from slate quarries. The most promising outlet for the material was thought to be its utilizatin as a filler in road asphalt mixtures, but further investigations have shown that in many products slate flour may be substituted for those materials more commonly in use without any marked effect on the quality of the finished article. Many products such as paper, rubber, floor coverings, paints, etc., require as one of their important constituents a considerable percentage of finely pulverized inert mineral matter to give "body," to obtain the desired consistency, or to supply the necessary wearing or other qualities demanded.

Consequently, as powdered slate appeared to present an alternative to present fillers the U.S. Bureau of Mines enlisted the co-operation of a number of manufacturing undertakings so that experiments could be made under actual working conditions. A wider use of slate in such products could result only from a definite price advantage as compared with other fillers. While it is probable that waste slate might be placed on the market at prices which would encourage its wider use, it is evident that a waste slate utilization industry can never attain sufficient magnitude to assist definitely the slate producers unless it is demonstrated that some marked advantage in quality may be gained when slate is substituted for fillers now in use. The main purpose kept in view throughout the inquiry was, therefore, to find advantageous uses for waste slate in order that both producer and consumer might benefit. So far as the rubber goods industry was concerned, both favourable and unfavourable reports were received. It was claimed by those reporting unfavourably that the resulting rubber was inferior in tensile strength, stretch, and wearing quality. One manufacturer claimed that slate flour made the products dry and hard with a tendency to crack. Several reports were received to the effect that the slate submitted was insufficiently ground, and that a finer grained filler would give better results. There was, however, a good deal of difference of opinion as to the efficacy of the material, and it would seem that where trouble was experienced it was probably the outcome of insufficient pulverization.

As regards other possible applications it may be noted that in oilcloth and linoleum the proportion of fillers varies from 20 to 70 per cent., the usual materials employed being china clay for white goods,

and ground red shale or red slate flour for red effects, etc. With such products pulverized quarry waste appears to show considerable promise, for slate flour compares favourably in price even with the cheaper grades of fillers, and when used in lieu of china clay the advantage in price is much greater. In fact, all the information which the Bureau has collected indicates that pulverized slate may be used with advantage as a filler in mechanical rubber goods and some classes of oilcloths, but it is not suited for use in rubbers of the grade employed for motor tyres. Fineness of grinding is the essential factor, and one of the most promising ways in which producers can promote the use of slate flour is by manufacturing a uniform reliable product at least 99 per cent. of which will pass a 300-mesh screen. The whole matter is one of just as much importance in this country as in America, and it will be to the advantage of quarry owners over here to keep in touch with the American developments.

The Organization of Chemists

AMONG the many interesting points discussed at the annual meeting of the British Association of Chemists in Manchester two may be selected for particular notice. The first is the attempt which the Association has been making to secure recognition on Whitley Councils, the Dyestuffs Development Committee, and similar bodies as representing the interests of chemists. It is certainly important and just that chemists should have a voice in the settlement of the problems such bodies discuss, but the practical difficulty often is that the authorities cannot recognise half-a-dozen organisations all claiming to be equally representative. It is no secret that in the matter of legislation, such as the Dyestuffs and Key Industries Acts, the Government actually does consult certain interests, and though theoretically there may be objections to the practice, it is found to serve the purpose. The only real remedy would be the creation of a chemical cabinet, representing all the organised interests and capable of giving collective advice.

The second point is the failure of the tentative negotiations for the amalgamation of the British Association of Chemists with the National Association of Industrial Chemists—both now registered under the Trade Union Acts—and the suggestion that the former should be affiliated to, or more or less merged in, the National Union of Scientific Workers. The deadlock in the negotiations is regrettable ; it means the continuance of some element of rivalry, even though it be entirely friendly, between bodies very similar in their bases and aims, and a weakening of their collective influence. Whether the alternative suggestion would improve the position is problematical. There are attractions, no doubt, in being linked up with a larger body, especially when on the present modest subscription the income is barely equal to the expenditure. But there may be serious drawbacks also. There is the loss of identity, and the consequent weakening of the appeal to chemists as a class. The movement is towards the dispersion of chemists among other interests instead of towards their consolidation into one large and distinctive unity. On these and other grounds the Association may be advised to move cautiously before surrendering any essential feature of its present character and autonomy.

The Calendar

Nov.		
7	Royal Institution of Great Britain : General meeting. 5 p.m.	Albemarle Street, Piccadilly, London.
7	Society of Chemical Industry (London Section) : "Comparison between Laboratory Fuel Tests and Practical Working Results of the Producer Gas Process." N. E. Rambush. 8 p.m.	Burlington House, Piccadilly, London.
9	Oil and Colour Chemists' Association : Ordinary meeting.	—
9	Royal Society of Arts : "The Work of the Industrial Fatigue Research Board and its Applications to Industry." D. R. Wilson. 8 p.m.	John Street, Adelphi, London.
9	The Industrial League and Council : "Industry and its Relation to Finance." Mr. E. J. Garmeson. 7.30 p.m.	Caxton Hall, Caxton Street, Westminster, London.
14	Chemical Industry Club : "Remarks on a Recent Trade Visit to Germany." E. H. Scholl.	2, Whitehall Court, London.
14	Society of Chemical Industry (Glasgow Section) : "Iron Portland Cement." E. H. Lewis. 7.15 p.m.	39, Elmbank Crescent, Glasgow.

Points from Our News Pages

A joint committee of the Association of British Chemical Manufacturers and the British Chemical Plant Manufacturers' Association publishes proposals for the standardisation of filterpress plates and invites criticism and suggestions from all interested in the subject (p. 558).

One of our chemical contributors writes on the effect of hydrogenation upon the vitamine content of hydrogenated oils used for food purposes and draws attention to the possibility of employing palladium as a catalyst in the place of nickel (p. 550).

A special correspondent who has just completed a tour of industrial Germany begins this week a series of letters in which he will record his personal impressions of "Germany seven years after" (p. 553).

Letters to the Editor are published from D. Brownlie ("Smokeless Fuel Developments"), Kemball, Bishop, & Co. ("Cream of Tartar"), and H. T. Watson ("Pulverised Fuel") (p. 555).

The members of the British Association of Chemists, at their annual meeting in Manchester, discussed a number of questions affecting the future of the Association and the interests of chemists in general (p. 558).

The Colour Users' Association (Manchester), in a circular just issued, recommend that licences for the importation of dyestuffs should be applied for in the name of the actual users rather than through agents (p. 562).

Dr. G. C. Clayton, in an address before the Liverpool Section of the Society of Chemical Industry, discusses the effect of the war on the heavy chemical industry (p. 560).

According to our market report, there has been a steady demand for chemicals during the week, with a continuance of the upward tendency and a weakening of continental competition (p. 570).

The death is announced of Dr. F. W. Passmore, consulting chemist ; of Professor F. E. Armstrong, professor of mining, Sheffield University ; and of Dr. J. W. Richards, professor of metallurgy at Lehigh University, U.S.A. (p. 552).

Books Received

THE GEOLOGY AND MINERAL RESOURCES OF THE SERB-CROAT-SLOVENE STATE. Being the Report of the Geologist attached to the British Economic Mission to Serbia. By D. A. Wray, London. H. M. Stationery Office. Pp. 104. 3s. 6d. net.

CHEMICAL WARFARE. By Amos A. Fries and Clarence J. West. London : McGraw-Hill Book Company, Inc. Pp. 445. 21s. net.

CHEMICAL LITERATURE AND ITS USE. By Marion E. Sparks. Second edition. Urbana, Illinois. Pp. 80. $1 post paid.

The Physiological Value of Hydrogenated Oils

The writer discusses the effect of hydrogenation upon the vitamine content of hydrogenated oils used for food purposes. Attention is also drawn to the possibility of employing palladium as a catalyst in lieu of nickel.

In a paper recently read to the members of the London section of the Society of Chemical Industry, Dr. Drummond gave a concise account of the present state of knowledge as regards the effect of high temperatures (such as are used in present-day refining methods in the edible oil industry) upon the vitamine content of these oils. Although definite chemical tests for the presence of vitamines are not yet available, it is known that in the case of every hydrogenated oil examined almost complete absence of vitamines is to be conceded. It is early to state that low temperature refining or hydrogenation will preserve the vitamines, and it cannot be definitely affirmed that high temperatures are entirely responsible for the destruction of vitamines, but, since the manufacture of hydrogenated oils is carried out universally (with the single exception of the United Chemical Works of Charlottenburg) at relatively high temperatures, it may be well to consider the question of the possibility of the production of hydrogenated oils at temperatures well below 100° C.

Vitamine Content of Hydrogenated Oils

Untreated vegetable oils undoubtedly contain vitamines, which are destroyed at some stage of the complete hydrogenation process. The raw oil is ordinarily submitted to a partial refining treatment prior to the actual hydrogenation, for the purpose of removing free fatty acids, and is afterwards submitted to the action of hydrogen at about 180°C., in the presence of a nickel or nickel oxide catalyst. Subsequent decolourising and deodorising treatments can have no influence upon the vitamine contents of the oil, since the only destructive influences here are those due to high temperature, to which, of course, the oil has already been subjected.

In spite of the fact that a Japanese chemist has stated that an actual increase in vitamine content of whale oil has been observed upon hydrogenation—a statement which requires confirmation—and of Drummond's observation that oxidation together with the influence of high temperature causes the destruction of the vitamines of lard, so that the reverse process of hydrogenation may possibly, in some cases, be found to reconstitute the vitamines, it is clear that if the ever-increasing use of hardened oils for edible purposes is to be physiologically justified, several courses are open to us.

1. Methods for the synthetic production of vitamines or the extraction of " natural " vitamines must be sought. Vitamine A could then be added to fats in which the original vitamine had been destroyed by refining or hydrogenation, or by any treatment during the process of manufacture.

2. It must be conclusively shown by strict tests that sufficient Vitamine A is taken in ordinary mixed diet to allow of the use of treated fats for their calorific value only; or alternatively, that the vitamine of the milk, added in the process of margarine manufacture, and which is not destroyed in the steps of the process subsequent to its addition, is sufficient in conjunction with the vitamines taken from other sources to allow of the use of the non-vitamine containing fats.

3. Suitable methods of refining or other treatment must be discovered which do not cause destruction of the vitamines naturally present in the original oil.

It is quite possible that, in the process of hydrogenation, the factor of high temperature is of the greatest moment in the destruction of vitamines. If this is so, it is satisfactory to know that there are technical methods available for the hydrogenation of oils which can be carried out at relatively low temperatures. Thus, the United Chemical Works of Charlottenburg have for some years been hydrogenating oils at a temperature of about 80°C., employing palladium as the catalyst.

Nevertheless, the temperature at which present-day hydrogenated fats are manufactured is usually as high as 180°C., and often above, and the operations are often prolonged for many hours before the requisite amount of hydrogen has been absorbed. Even in the presence of a non-oxidising atmosphere, the above conditions seem unfavourable to the preservation of vitamines in a fully active state, and the practical certainty that a non-oxidising atmosphere and a temperature of 80°C. would represent conditions allowing of the retention of the activity of vitamines, renders it opportune to review the methods of hydrogenation.

The Problem of Temperatures

The question of hydrogenation is well understood, so that attention will be chiefly directed here to the two broad classes of operation—namely, those at high temperatures, say, about 180°C., and those at relatively low temperatures, say, below 100°C.

Many varieties of catalyst may be employed, but it may be generally affirmed that in the former class of hydrogenation operations a nickel catalyst is employed in some form or other, *i.e.*, reduced metallic nickel, nickel oxide, and so on. For carrying out hydrogenation at low temperatures, it is necessary that a noble metal catalyst be used, and different methods for the application of, for instance, a palladium catalyst have been suggested.

Before passing to a more detailed consideration of these hydrogenation methods, it should be noted that if hydrogenated oils are produced with a content of vitamine undiminished in quantity or activity, there would still remain the question of the refining treatment This, usually carried out after the hydrogenation, may embody a decolorising treatment with fuller's earth, in which case selective absorption of vitamine may occur. The deodorisation treatment most commonly practised consists of a steam blowing at about 180°C., *in vacuo*, and it is possible here, too, that partial destruction of vitamines may occur. It is therefore essential that the chemist should have information as to the specific effects of heat and of oxygen before a definite recommendation can be made as to the most satisfactory oil treatment process. It is only just to the bio-chemist to state that intensive efforts are being made to supply this information.

Hydrogenation at High Temperatures

The original process for the hydrogenation of oils, patented by Norman in 1903, was an adaptation of the classical methods of Sabatier and Sendrens, and is the foundation upon which all present-day oil hydrogenation processes are built. It is true that many other catalysts have been suggested and that many are in use, but, leaving out of consideration here the vexed question of the possible activity of nickel oxide as catalyst, or whether or no it is always converted to metallic nickel at some point in the process, and passing by, also, the nickel suboxide problem, it may be stated that all catalysts employed to-day consist of nickel or its compounds obtained in a high state of effectiveness by the particular method of production or by the presence of promoters.

Without exception, however, the temperature to which an unsaturated gylcerine must be heated in the presence of a nickel catalyst in order to effect absorption of hydrogen at a rate sufficiently rapid for technical purposes is in the region of 180°C. With pure hydrogen and a well-refined oil, the temperature at which maximum rate of reaction is achieved in the presence of active nickel is 180°C., although many industrial processes employ temperatures up to 250°C. The use of a base metal catalyst at such temperatures entails several disadvantages, which, however, up to the present have not had sufficient weight to be considered too critically. Solution of a certain amount of metallic nickel by means of the fatty acids contained or produced in the oil invariably occurs, so that the finished product can be shown to contain traces of nickel soap. It has repeatedly been claimed, with probably justification, that the quantities of nickel taken with food-stuffs prepared from hydrogenated oils are too small to have injurious effects upon the human system. Norman himself showed that foods cooked in metallic nickel utensils contained as much nickel as oils prepared by his hydrogenation process.

Oils hydrogenated at temperatures of 180°C. and thereabouts almost invariably decompose in the process to a slight extent, leading to the formation of free fatty acids and further decomposition products. The oils, therefore, possess a " hardening taste " which is very apparent to an expert, and which, together with the characteristic hardened oil smell, must be removed if the oil is to be used for edible purposes. The process using some form of nickel catalyst is, however, so much cheaper than that in which the metals of the platinum group are used as catalysts that it has found universal favour in spite of the above-named disadvantages, the only company

working the latter form of the hardening process being the United Chemical Works, Charlottenburg.

Catalysts

Passing to a brief review of the more important catalysts employed to-day, it may be noted that the first advance upon the original reduced nickel, prepared according to the Sabatier-Sendrens method by Norman, was the spreading of the active nickel upon a porous support. For this purpose infusorial earth, powdered pumice stone, talc and the like were impregnated with a nickel salt, nickel carbonate or hydroxide precipated, and the latter reduced in hydrogen after suitable drying. Although many catalysts have been patented since this type was suggested, it is certain that none can compete with it when both cost and activity are taken into account. Its one disadvantage is the difficulty in regenerating when spent, due to the complications arising from the support, whilst, in the case of nickel itself, solution in acid, filtration, and re-use of the solution are simple, straightforward operations. Methods have, however, been suggested for the regeneration of supported catalysts without involving solution of the metal in acid.

The B. A. S. F. have patented an interesting catalyst support in the form of a natural or artificial zeolite. The nickel salt solution is impregnated into the porous zeolite, whereupon base exchange takes place, and a nickel double silicate is formed. Upon subsequent reduction in hydrogen an efficient nickel supported catalyst is obtained, in a form which is useful in the " tower " systems of oil hydrogenation on account of its granular nature. Its use in vapour hydrogenations is suggested, as it obviously possesses advantages over catalysts supported upon light powders such as talc, infusorial earth, &c.

An example of the effect of promoters upon catalysts is to be found in the proposals of Dewar and Liebmann, who use a mixture of nickel and copper. The carbonates of the metals are co-precipitated. The dried mixture may be reduced at temperatures much below that at which nickel oxide must be reduced for maximum efficiency. The mixed catalyst may, in fact, be reduced under the oil which it is subsequently to hydrogenate. This catalyst has had little application in technology, however, its advantages, if any, being offset by the ease of preparation, cheapness, and constancy of the nickel on the porous support type of catalyst.

Colloidal Nickel

An interesting process, which, however, possesses many practical difficulties, is that of Shukoff and Lessing. Colloidal nickel is produced in the oil itself by the decomposition of nickel carbonyl. The latter is prepared in the ordinary manner by passing a gas containing 5 per cent. and upwards of carbon monoxide over reduced nickel. The carbonyl passes in gaseous admixture with the excess gas used in its manufacture—chiefly hydrogen, but containing varying quantities of unused carbon monoxide—into the heated oil. Decomposition into very active nickel is effected spontaneously, and hydrogenation proceeds.

Even if the nickel produced in this manner had an extremely high activity, there are concomitant disadvantages. The effect of carbon monoxide as an impurity in the hydrogen used in oil hydrogenation is well known. The gas may be regarded more in the nature of a retarder than as a substance permanently toxic to the catalyst, but in any case its effect is great at 180°C. At temperatures above 200° its influence upon the speed of hydrogenation becomes less marked, so that the Lessing catalyst necessitates the carrying out of operations at temperatures above 200°C., unless the rate of production is to be seriously interfered with. Catalyst recovery and determination of quantity in the hardening operations are also difficult.

A recent improvement by Lessing must be noted in which the nickel carbonyl is absorbed by a substance such as highly absorptive charcoal, and the latter used to give definite quantities of catalyst in the oil and to avoid the passage of unnecessary and harmful carbon monoxide into the oil treatment vessel.

A catalyst of the Bremen Besigheimer Oel Fabrike (who do not use this type, probably, in their actual manufacturing processes) consists of a mixture of reduced nickel and carbon produced simultaneously. It is claimed that the latter constituent has an appreciable effect in diminishing the characteristic odour and taste of hardened oils. If such a catalyst could be prepared in a high state of activity, both as regards its power of assisting the absorption of hydrogen by the unsaturated oil, and as regards its effect upon the odour and taste-giving components of the hydrogenated oil, it would represent a distinct advance in catalyst preparation.

Several patents have been obtained for the preparation of a reduced nickel catalyst without the use of hydrogen as reducing gas. The recent patents of Schuck may serve as examples. A nickel salt solution, for instance the nitrate, is allowed to flow into a heated tube after being admixed with a carbon-containing substance, for example, sucrose. In an inert atmosphere decomposition takes place, and the nickel oxide produced is reduced by means of carbon, resulting from the decomposition of the sucrose. The catalyst can be obtained, if desired, with a certain content of free carbon. It is claimed that these catalysts are not so easily oxidised in the air as the reduced nickel prepared by the Sabatier-Sendrens method.

Passing now to a consideration of the oxide catalysts, short notice must be given to the Bedford-Erdmann-Williams type. These catalysts may be said to have originated with the work of Ipatiev, whose extensive researches need no full discussion here. The question as to whether the oxide is a true catalyst, or whether, before hydrogenation can be induced, reduction of the oxide to metallic nickel must and actually does take place, cannot be treated in short space, and must be merely referred to. It will suffice to state that by the use of a finely divided nickel oxide added to the oil originally hydrogenation can be effected at 255°C., and later the temperature may be reduced. A voluminous nickel oxide, prepared with care and used in a prescribed manner, will give excellent results, and is in extensive use in this country and in Germany. The tendency towards the decomposition of the glycerides, free fatty acids being produced together with other side products, is increased in this high temperature hydrogenation process, but several advantages are claimed. The catalysts are stated to be more resistant to poisons, notably to sulphur and chlorine. Moreover, the presence of carbon monoxide in the hydrogen employed in the hydrogenation step is of relatively little moment. In this latter connection, however, it is probable that the temperature at which the hydrogenation is effected is the determining factor, for it is easily shown that the retarding effect of carbon monoxide upon the rate of hydrogenation is much less pronounced at 200°C. than at 180°C.

All the catalysts which have been briefly described can effect the hydrogenation of oils only at temperatures above, say 175°C. It is true that the union of hydrogen with the unsaturated glyceride can be observed in the presence of many of these catalysts at temperatures as low as, say, 140 to 150°C., but the rate of reaction is decidedly too slow for technological purposes. In fact, it is certain that the manufacture of hydrogenated oils is nowhere effected at temperatures lower than 160° and, in general, at 180° and above—the process employing palladium as catalyst (*infra*) of course being excluded from this generalisation.

Hydrogenation at Low Temperatures

The activity of platinum as a low temperature catalyst in the production of water from hydrogen and oxygen was observed by Faraday, almost a century ago, during his classical researches upon the hydrogen voltameter, and in 1906 Fokin discovered that palladium black would catalyse the reaction between hydrogen and oleic acid, and allow of complete transformation of the latter into stearic acid at temperatures as low as 80° to 90°C. Platinum black, on the other hand, was by no means so efficient a catalyst. The elaborate researches of Paal and Willstatter, however, demonstrated the wide applicability of the noble metal catalysts in effecting the reduction of organic compounds of varying types. In the majority of these experiments, if not in all, the catalyst was employed in the presence of a protective colloid. Paal, for instance, used the sodium salts of protalbinic and lysalbinic acids in order to prevent flocculation of the catalyst with consequent de-activation.

Several attempts to utilise this type of reaction in the hardening of oils were made, but in general were of little commercial value. For instance, Skita proposed to hydrogenate olive oil at about 70°C., and under 4 atmospheres of hydrogen pressure by using an aqueous solution of alcohol as emulsifier for the oil. No protective colloid was to be used, but the addition of a small quantity of hydrochloric acid was suggested. Later patents by Skita showed that the acid could be dispensed with in certain cases. These processes laboured

under the difficulty of cost when considered for technical use, and the employment of alcohol had to be dispensed with. This was done by Skita, who, in a later patent, proposed the use of the cheap gum arabic as a stabilising colloid.

The practical application of palladium as a hydrogenating catalyst was, however, only effected when it was discovered by Paal that the noble metal in the form of chloride could be introduced directly into the oil to be treated, in the absence of protective colloids or of emulsifiers such as aqueous alcohol. The United Chemical Works of Charlottenburg took up the process and have had it in successful technical operation for many years.

Platinum or palladium chloride (but preferably the latter) is absorbed by an oxide such as magnesium oxide, or by a carbonate such as calcium carbonate, or by a porous infusorial earth or talc, or the like. Alternatively, palladium may be supported upon nickel or magnesium in the metallic state. It is important that such anti-catalytic metals as lead, aluminium, iron and zinc, and the salts of the first three, should be absent. The noble metal chlorides are easily reduced to the colloidal metallic state in the cold and more satisfactorily upon warming, so that the catalyst is introduced into the oil to be hydrogenated, the mixture warmed, and hydrogen then introduced. At a temperature of about 80°C., hydrogenation occurs at a technically suitable rate, even in the presence of as low a concentration of palladium as 0.002 per cent. The pressure maintained during the hydrogenation is three atmospheres or higher.

It is clear that the precautions in the technical operation of this process centre around the prevention of loss of the expensive catalyst. The latter becomes partially flocculated during the hydrogenation operations, but for recovery the whole is brought into this state, or into solution by treatment by means of suitable acid, for instance hydrochloric acid, for the first of these operations. Elaborate precautions are observed to avoid mechanical loss and the collected flake palladium is reconverted into the chloride for re-use by means of *aqua regia*. It is stated upon good authority that the Charlottenburg Company, working at sufficiently high rates of reaction with 0.002 per cent. of palladium, experience a loss of only from 5 to 7 per cent. of this small concentration of catalyst. Thus in the hydrogenation of 1,000 kilos (1 ton approximately), 20 grammes only of palladium would be used, and the loss would be in the region of 1 gramme. Hence, the charge upon the process due to losses of catalyst would amount to 12s. per ton of oil hydrogenated. This represents, of course, a much higher charge than is incurred when nickel is used as the catalyst, even though a much larger proportion of the latter is lost, mechanically and in solution, in the free fatty acids in the oil, but is not a very serious factor if weighty considerations such as the preservation of vitamines are at stake.

Additional advantages also appertain to this process. It is obvious that no metal will be found in the hardened oil, and that the production of free fatty acids will be negligible. Moreover, decomposition products leading to the "hardened oil taste and smell" are largely, if not entirely, absent. The preparation of the catalyst in highly active form necessitates no careful reduction in hydrogen at temperatures above 300°C., and the steam consumption for heating the hydrogenation vessels is comparatively slight if a rapid rate of hydrogenation is ensured.

Interesting experiments on a similar process, in which the Skita gum arabic stabiliser for the catalyst was used, are described by Nord (*Zeit. Angewan. Chem.*, 1919, p. 355). In these experiments the use of alcohol as emulsifier for the oil is shown to be of little advantage, and a small quantity of gum arabic—$\frac{1}{500}$ of the quantity of oil under treatment—is employed as protective and stabilising colloid. Hydrochloric acid was found to be of use in all cases with the exception of the hydrogenation of Japanese whale oil. Quoting one of the most successful experiments, both from the point of view of small concentration of catalyst, and over-all efficiency of hydrogenation, it may be stated that 100 grammes of cotton-seed oil were mixed with 10 cubic centimetres of gum arabic solution (1 per cent.) and a like amount of palladium chloride solution of the same concentration. Hydrochloric acid was also added in like amount. The mixture was energetically stirred and warmed to about 60°C., when hydrogen was introduced. Reduction of the chloride immediately takes place, and hydrogenation proceeds under a pressure of about 4 atmospheres. In 10 hours a fat melting at 50°–55°C. was obtained.

It may be stated at once that if this represents the best that can be achieved by the use of a palladium catalyst in the presence of gum arabic as a protective colloid, the process is little likely to rival the nickel catalyst process. The concentration of catalyst—0.1 per cent. of palladium chloride—and the slow speed of saturation of the oil with hydrogen compare very unfavourably with similar experiments with nickel. 0.1 per cent of a good nickel catalyst (working in oil at 180°C., it is true) will enable an equal hydrogenation to be effected in less than two hours. Moreover, in the above case with palladium chloride, even a 1 per cent. loss of catalyst in the recovery operations would throw a charge upon the process of at least 75s. per ton of oil treated, taking palladium chloride at its present price. It is certain, however, that in the Paal process reasonably high rates of hydrogenation are effected with low concentrations of catalyst. In conclusion, therefore, the use of palladium as a catalyst in oil hydrogenation is a proved technical possibility, and supplies of the metal are sufficient to prevent excessive prices being demanded in case of the more universal adoption of the metal as catalyst.

If all the oils hardened in England were manufactured by using palladium as catalyst, the quantity of the latter required for replacement would not exceed 200 lb. per annum. The operations of hydrogenation could be carried out at a temperature of 70–80°C., and, of course, in a non-oxidising atmosphere. It is, therefore, probable that, unless vitamines are destroyed or removed in the prior treatment of the oil for the removal of free fatty acids, colouring matters, &c., the vitamine content of a hydrogenated oil can be retained, in amount approximately equal to that of the original crude oil.

Death of Dr. F. W. Passmore

We regret to announce the death, which took place on Saturday, October 29, of Dr. Francis William Passmore, consulting chemist, of 81, Queen Victoria Street, E.C., and "Stonefield," Woolwich Road, Bexley Heath. The circumstances of his death add to the regret and sympathy with which the event would in any case have been received. Dr. Passmore was out walking on Bexley Heath when he collapsed and died from heart failure. The news came as a great shock to all his numerous friends who had seen him happy and contented before he left his laboratory after the week's work.

Dr. Passmore occupied an eminent position as consulting chemist and analyst and was considered a leading authority on all chemical and technical problems. His proverbial fairness even gained him the respect and admiration of those he was compelled to act against—when, for instance, he had to appear as expert in many difficult legal disputes—and those who knew him required no further testimony to his ability and character. He had the happy quality of inspiring with affection those with whom he worked and came into contact.

The son of a sub-editor of the *Pharmaceutical Journal*, Dr. Passmore was born in 1868. He became a pupil of Dr. B. H. Paul, and after five years' training continued his studies at the University of Wurzburg. There he worked with Professor Emil Fischer, under whom he also obtained his Ph.D., and for whom he always retained the highest regard.

On his return to England, Dr. Passmore entered the Research Laboratories of the Pharmaceutical Society under Professor Wyndham R. Dunstan, and in 1892 he began practice as a consulting chemist, and soon succeeded in making a reputation for himself. He was a pioneer in many directions where circumstances permitted him to introduce new industries into this country, and in spite of his undoubtedly great success he often wished he had entered an academic career, for which he had a great liking. He leaves a widow and three sons, one of whom intends to follow his father's profession.

The funeral took place at Bexley Heath Cemetery on Wednesday, and was largely attended by friends and professional colleagues.

Professor F. E. Armstrong

We regret to record the death on October 28, after a brief illness, of Professor F. E. Armstrong, M.Sc., Professor of Mining at Sheffield University. Born in 1879, he had an extensive experience of mining, and in 1913 became Professor of Mining at Sheffield University, in which position he achieved a marked success. He took an active part in all branches of the Applied Science Department at the University. In 1917-18 he was appointed head of the Labour and Wages Section of the Coal Mines Department of the Board of Trade, and was a member of the committee appointed by the Government in 1919 to test and recommend safety lamps for use in coal mines. The interment took place on Tuesday afternoon at Golders Green Crematorium.

Germany Seven Years After

By C. H. Hughland

I.

THERE was a time when Germany was the best customer this country had. She used to buy from us year by year about sixty million pounds' worth of goods. That is the main reason why the condition of Central Europe can never be without a definite interest for the commercial community of Great Britain. Is there another country in the world of which so much has been written? Since the accession of the ex-Kaiser, one of the best advertisers of recent times, Germany drew a great deal of attention to herself chiefly by the spectacular growth of her fleet and her armies, and by her definite endeavour to capture the supremacy of the air. All the world knows what happened to that side of Germany, but now that it has disappeared what kind of country is left? What is the spirit which animates its business men and its workpeople? Is there any reserve of strength which the shattering of German militarism has left intact? Is she likely, cut off from her former sources of supply for raw materials and her former markets, to regain her position as one of the prominent commercial nations of the world?

"Down, But not Out"

These are some of the questions which thoughtful men in all countries are asking themselves—questions to which I endeavoured to get answers at first hand during an extended tour through Germany, in the course of which I had exceptional opportunities of coming into direct contact with many phases of industrial and agricultural life. Nothing could be more prejudicial to a just appreciation of the present position of the country and its prospects than to endeavour to sum up the impressions of such a tour in a word or two or a phrase or two. We have been told during the past twelve months by one publicist that Germany is working hard; by another that she has nothing to do. Some observers endeavour to impress us with the wealth of the country; others with its poverty. If it were part of my task to sum up my impressions in half a dozen words I think they might be best conveyed by the phrase that "Germany is down, but not out." I will endeavour in subsequent articles to give first of all instances of my view that Germany is down, and secondly proofs of the contention that she is not out. In this way readers will be able to form an unbiassed judgment themselves, for the problems with which the world is faced are so serious that it becomes necessary to get at the facts and draw conclusions from them with a judgment as far as possible unclouded by the inevitable legacy of bitterness bequeathed by years of war.

Before leaving England a friend who knows Germany well, having visited it constantly year by year both before the war and since, said to me, "You will find the country very much altered; the cities and towns are almost as untidy and dirty as they are in England." It seemed to me at the time that that is the sort of comparison which is unhelpful, foolish, and in every sense odious. The comparing of one country with another does not, after all, carry one very far. Each land has its own special characteristics. Its people have their own special qualities and defects. Great tracts of the manufacturing parts of England are, in reality, nothing more or less than enormous forges and foundries: hence our saying that where there's muck there's money. In the matter of cleanliness it is absurd to compare a land devoted to heavy engineering with one in which vast tracts of country are devoted to agriculture or the entertaining of visitors in health resorts; the comparison which is serviceable is that which can be made by a man who has been conversant with a country over a long term of years. It is the same when computing the value of an individual. Some men remain stationary; others develop. The really illuminating comparison is between the mature man of fifty and the youth of five-and-twenty. Has he progressed? How much or how little has he helped or hindered his generation?

The Germany of 1921 and 1914

There are differences between the Germany of 1921 and the Germany of 1914, but there are still greater differences between the Germany of 1921 and the Germany of 1895. There are also some things which have remained and must inevitably remain unaltered. The Hohenzollerns have gone, but seventy millions of people need some figure-head, and time will show whether they are entirely satisfied with the Government which now represents them. The brilliant uniforms have given way to the sober tones of civilian clothing, but the discipline inculcated by five-and-twenty years of intensive military training remains.

On one point there is no uncertainty whatever. When the armistice was signed the Germans, whether they happened to be capitalists controlling enormous enterprises or workers playing their part in a humbler sphere, were under no illusions whatever as to the nature of the position in which they were placed. They knew perfectly well—how could it be otherwise?—that whatever hopes they entertained for the future could be realised only by their own unaided efforts. They had played their hand and lost it, and they found themselves internationally without a friend in the world. The Entente countries were their late enemies; Austria had gone to pieces; Italy had deserted them; Russia was in ruins; their Colonies had been lost, not only in the Old World but in the New the balance of public opinion was against them.

It is true that Germany is working hard, but that involves nothing very new. German industry is proverbial. But there is another motive which actuates them at present. It is far more apparent to them than it is to some of the other nations, that they must either work or perish. What have they but work to offer to the world? It is necessary that they should labour diligently with their hands if they are in course of time to regain the prosperity which they threw away when they made an unsuccessful bid for the hegemony of the whole world. And they are doing it.

The Inventor of the Gas-Mask.

A memorial plaque to the late LIEUTENANT-COLONEL E. F. HARRISON, R.E., Controller of Chemical Warfare, was unveiled on Wednesday afternoon at the Pharmaceutical Society's Examination Hall, Bloomsbury Square, London, by Sir L. Worthington Evans (Secretary of State for War). Colonel Harrison was the inventor of the small box respirator, the metal container of which was known in the army as "Harrison's Tower."

Mr. E. T. Neathercoat (President of the Society) said that Harrison's first connexion with pharmacy was in 1884; and he joined the Sportsman's Battalion as a private in 1915 at the age of forty-seven. When the first German gas attack was made, he was transferred to the Royal Engineers; and in 1916, mainly as a result of his ceaseless research and his co-ordination of the work of his subordinates, the small box respirator was produced. This gas-mask rendered its wearer immune against every form of gas-frightfulness that the ingenuity of the enemy's chemists had evolved. It was at once adopted by the authorities, and before the end of the war no fewer than 20,000,000 had been manufactured for the use of the British armies and those of our Allies. He died on November 4, 1918, from pneumonia, which was probably aggravated by exposure to gas during the course of experiments.

The Secretary for War, after unveiling the memorial, announced that he was awaiting with interest the report of a committee on which three distinguished members of the Pharmaceutical Society were sitting and which had recently been engaged in investigating scientific and administrative questions of vital importance to the medical service, and, therefore, to the fighting efficiency of the Army. The problem that Colonel Harrison was called on to solve was perhaps one of the most dramatic in warfare—to provide in the middle of a war, almost in the middle of a battle, an armour that would be proof against a new and sinister weapon, deadly to a degree hitherto unimagined in warfare. It was said to the honour of ancient kings that they slew their thousands and their tens of thousands. It would be Harrison's memorial that he saved them, for not a man was sent to the Front in the later years of the war who might not have to depend for his life at some unexpected moment on the skill and knowledge of the scientist whom they commemorated that day. The debt that the British Empire owed to science could scarcely be measured.

Recent Wills

Mr. W. H. Emeric de St. Dalmas, of Fairfield, Clarendon Park Road, Leicester, manufacturing chemist	£15,747
Mr. R. Harrison, of Middleton Road, Oldham, dry soap manufacturer	£22,660
Mr. James Cornwall, 37, Ash Grove, Hull, Secretary of the Hull Oil Manufacturing Co.	£5,502

Reviews

American Sulphuric Acid Practice. By De Wolf & Larison. McGraw-Hill Book Co. Pp. 270, 21s.

This volume has been written to cover modern American practice in a compact form. It comprises twenty-two chapters, an appendix, and an index. The subject matter on the whole is well arranged. It is printed on good paper and in clear type, is well provided with photographs and sketches of the various parts and accessories of a sulphuric acid plant, and not only deals with the chamber process, but devotes five chapters to the contact process. There are evidences that the book has been rather hurriedly written, and the proofs equally hurriedly revised. "Wessel" for "Messel," "Hanish" for "Hansch," "coppers" for "copperas," are but a few.

The chapter dealing with sulphur as a raw material—its recovery, combustion and properties, &c.—is replete with information in small compass. Experience has proved that the types of mechanical sulphur burners described are reliable and admirably suited to fulfil their purpose. Information follows concerning pyrites, pyrites lump, and fines, burners, and mechanical burners. Brief instructions are given relative to the starting of burners, which should prove of interest to works managers and foremen. The thermal calculations furnished, as affecting the distribution of the heat units arising from pyrites combustion are interesting but not beyond criticism. The sintering of pyrites cinders, with details of modern sintering plants, is suitably dealt with. No mention, however, is made of the Greenawalt sintering process, which is becoming increasingly popular both here and in America.

The chapters on dust chambers, Glover tower, chambers, Gay Lussac towers, acid circulation, introduction of nitre, draft, testing, operation, and concentration, will all be read with keen, and no doubt critical, interest by technicians. After perusal many will be inclined to believe that, as regards American practice, there is much that remains empirical and needs further elucidation, especially as affecting the basis of the design of Glover and Gay Lussac towers, acid chambers, and concentration plants.

The chapters dealing with the contact process, succinct though they are in character, cover much ground. One would have wished, however, for specific information on this process. The view expressed that "while the contact process has many advantages over the chamber process, it is very doubtful if it will ever completely replace the chambers" is one that is generally shared in this country. It would appear that each process has its peculiar *rôle* which is unlikely to be disturbed except by scientific advancement or economic circumstances at present unforeseen.

P. Parrish.

The Physical Properties of Colloidal Solutions. By E. F. Burton, B.A., Ph.D. Longmans, Green & Co. (Second Edition). Pp. 221, 12s. 6d.

It is very gratifying to note the publication of a second edition of this work, as it is indicative of the greater attention that is now being paid to this branch of science, which has solved several technical difficulties already, and doubtless in the near future will solve many more which, up to the present, have defied solution.

The present volume follows the order of the first edition, but "certain parts, particularly the chapters on introduction to the subject, and on the coagulation of colloids have been almost entirely rewritten in the light of recent work."

To those unacquainted with the first edition of this work the following synopsis of the contents of the book will indicate the wide field covered. Chapter I. is introductory and gives a brief outline of the historical development of the subject, and shows how advances in microscopic optical technique have helped this development. Chapter II. is on the preparation and classification of colloidal solutions and deals with these subjects in an exhaustive manner. Chapter III. is devoted to the study of the ultramicroscope. Chapter IV. is a very valuable contribution to the study of the Brownian movement. Chapter V. deals with the optical properties of colloidal solutions. Chapter VI. is on the measurement of sizes of ultramicroscopic particles. Chapter VII. deals with the phenomenon of cataphoresis. Chapter VIII., occupying forty-one pages, deals with the important question of the coagulation of colloids. Chapter IX. is on the theory of the stability of colloids and Chapter X. completes the work with a very brief outline of the practical applications of the study of colloidal solutions. This chapter might usefully have been extended, particularly in the light of recent developments, *e.g.*, the colloidal nature of catalysts, &c., though, as the author states, "such a topic requires a whole treatise to itself."

The work will be especially useful to those who are working in the field of colloidal solutions, there being a very full bibliography of the subject provided—over 400 references to original papers and works, covering every aspect of the subject. The general student will also find it a useful addition to the more elementary books on the subject. The book is well printed, and is provided with both a subject and a name index.

F. E. W.

Soil Conditions and Plant Growth. By E. J. Russell. London: Longmans, Green & Co. Pp. 406, 16s.

The issue of a fourth edition of Dr. E. J. Russell's well-known book on "Soil Conditions and Plant Growth" marks a new stage in the progress of agricultural science. When, nine years ago, it first appeared in the series of Monographs on Biochemistry, 166 pages sufficed for a comprehensive account of the knowledge then available. Such strides have been made in the meantime that the present edition has been extended to over 400 pages, and at the same time constitutes the first of a new series, the Rothamsted Monographs on Agricultural Science.

The present volume provides a most valuable introduction to this important series, giving a broad survey of the whole subject as it stands at the moment, while leaving the detailed description of the various special branches such as Soil Physics, Protozoa, Soil Fungi and Algæ, to the separate monographs which are being prepared by the heads of the departments at Rothamsted. That the present work has been brought right up to date is evidenced by the fact that it includes references to work published as recently as July last. The chapter on Soil Colloids, introduced into the third edition, has been extended, as also have the references to Soil Protozoa in relation to the flora and fauna of the soil and their influence on fertility. Attention has been recently focussed on the hydrogen on concentration of a soil and its fertility, and this interesting and promising line of study is expounded in the clear and lucid manner that one has come to associate with Dr. Russell's writings. Few men possess such an aptitude for concise expression of scientific facts in an eminently readable form, and this feature is apparent throughout the present volume.

In addition to an appendix dealing with current methods of soil analysis, there is a carefully selected bibliography of some 320 references which will be of great value to the soil student. The book is assured of a very cordial welcome, and the issue of the remaining monographs will be awaited with interest.

Bernard F. Davis.

Laboratories, their Planning and Fittings. By Alan E. Munby, M.A., F.R.I.B.A. London, G. Bell & Sons Ltd. 1921. Pp. 213, 25s.

It is claimed by the author of this book that "search has not revealed any work now in print published in this country which endeavours to deal with laboratories in a manner calculated to bring a building committee, a professional staff, and their architect on common ground for what is essentially a joint undertaking," and, so far as the reviewer is aware, the claim is a sound one. The subject generally is so wide that the author, very wisely, has confined himself to the consideration of buildings and fittings for what may be termed educational science as contrasted with technical and workshop requirements. To deal with the latter would, indeed, require not one, but a whole army of experts. Sir Arthur Shipley (ex-Vice Chancellor of Cambridge University), in an historical introduction, states that the first case of practical work which he can trace occurred in connexion with Christ's College, and is mentioned in an ordinance of 1505; but the astronomers and anatomists had long previous to this made use of special buildings for the pursuit of their subjects. Still, the contrast between the establishments of these early days and the modern "laboratory" is of itself of considerable educational as well as of historical interest. After some general remarks on the initiation of schemes, the author deals with the specific requirements of chemistry, physics, biology, and geology. Then follow descriptions and illustrations of some recent designs of various magnitude. Among these are a number of London and other school designs, British University and Technical College designs, and details of various French, German, Russian, and American scientific laboratories and buildings.

The book is profusely and well illustrated, and the publishers may be congratulated on the printing and general "get up" of the work. It can be cordially recommended to all those interested in the erection, administration, and working of laboratories devoted to scientific instruction. P. S.

CONFECTIONERS' RAW MATERIALS. By James Grant, N.Sc.Tech., F.I.C., &c. London. Edward Arnold & Co. Pp. 173, 8s. 6d.

A handy volume intended primarily for confectioners, though cookery teachers and others may find it useful and instructive. An attempt is made to give, in simple language, an account of the sources, methods of manufacture, chemical constituents, adulterants and methods of detecting them, the more important uses of the materials, and in some instances the quantities required for different purposes.

"The Case of Cream of Tartar"

To the Editor of THE CHEMICAL AGE,

SIR,—We have read with interest your article headed "The Case of Cream of Tartar" in your issue of October 29. You state that "a strong protest is being prepared by a number of the leading importers and distributors of cream of tartar against its inclusion in the [Key Industries] list. Why are they protesting? You say it is but fair to British manufacturers to state that generally they have not taken advantage of the Act to put up their prices. Then, if prices are the same as before the Act, and there are British merchants still wishing to trade in it, and we are willing to sell, as we are, the only inference we can gather from the protest is that they prefer to trade in it if it is *not* British made.

We have erected a large factory to enable us to supply the whole of the United Kingdom, and, therefore, there is no reason whatever why "the leading importers and distributors" should not buy from us.

What is a key industry? What is a fine chemical? We should have thought that an article so essential in the production of foodstuffs as cream of tartar is entitled it to be classed as one of the highest forms of a key industry.

If foodstuffs are not *the* Key Industry, then we fail to understand the term. Yet cream of tartar is not a foodstuff. It has in itself no nutritive value. It merely makes the food value present easier of assimilation. It is the "pepsin" of food, not the "malt."

The British Pharmacopœia prescribes a purity of 99 per cent. potassium bitartrate; our product tests but a decimal point or two under 100 per cent. It is prescribed as a medicine in the Pharmacopœia, and the fact that cream of tartar has always been recognised as a fine chemical can be clearly seen from an examination of the trade papers of the chemical industry, where cream of tartar is classified under pharmaceutical chemicals.

The raw material does not come from one country only, but from several. An export duty on it would merely fall upon the people of the country imposing the duty and exporting it. No European country producing the raw material uses within its own borders anything more than a small proportion of its production of raw material.

And what of the advantages to this country, when goods are manufactured here and not imported? We, as large makers of cream of tartar, have an office routine, no doubt very similar to the merchant's; therefore, in our clerical departments we employ as many clerks as he would. In addition, however, we have large factories teaming with skilled producers, and the many classes of skilled maintenance workers that a factory requires. We pay taxes on our manufacturing profits, and the merchant will still pay taxes on his profit by selling our article. We employ chemists, but, what is more, we are training chemists, and we all know now that it is the chemist and engineer that made Germany the great and prosperous manufacturing country that it was prior to the great war.

By manufacturing here more workers are employed, more taxes reach the Exchequer, more chemists and engineers are produced. Then why protest against an Act that makes all this possible?—We remain, etc.,

For KEMBALL, BISHOP & CO., LTD.
J. E. WHITEHALL, Joint Managing Director.
Crown Chemical Works, Bromley-by-Bow, E.3.
31 October.

Smokeless Fuel Developments

To the Editor of THE CHEMICAL AGE.

SIR,—With regard to the article, "Smokeless Fuel Developments," in your issue of October 22, I should be much obliged if you would allow me the privilege of a few remarks, as, by the courtesy of Messrs. Low Temperature Carbonisation, Ltd, and Messrs. Close Brothers & Co., Ltd., I have had numerous opportunities of examining the plant at Barugh, near Barnsley.

There has been such a large amount of attention given in the daily and technical press to the epoch-making discoveries made on this plant that I am sure I have not been able to read all the notices, but I have had the opportunity of seeing a very large number of them. I have not been able to discover any reference to a "revolutionary fuel invention" or to the "discovery" of low temperature carbonisation. What has been stated, quite correctly, is that for the first time the practical problems of low temperature carbonisation have been solved, which can certainly be described with justice as an industrial revolution.

In this connection I would like to point out that the people associated with the plant at Barnsley are the original inventors of the process of low temperature carbonisation, and this coalite process embodies the work of the late Mr. Thomas Parker and of Mr. F. W. Salisbury Jones, together with the assistance of Prof. Vivian B. Lewes, Prof. James Swinburne, Sir William Preece, Prof. H. E. Armstrong, and other distinguished scientists.

Parker commenced operations in 1900, and the present success is the culmination of twenty-one years' continuous work in the face of incredible difficulties, involving the expenditure of over £1,000,000, the erection of forty-two different types of retort, and the carbonisation of nearly 250,000 tons of coal. No one in the world has had anything like this experience of low temperature carbonisation, and only one other process is working—in America—on what may be called a practical scale.

The "commercial solvency" of the coalite process is less at the mercy of prevailing markets for primary and secondary products than the old-established existing high temperature carbonisation processes, the gas works and the coke oven, since coalite has a universal use in place of coal, and not, like soft gas works' coke and hard metallurgical coke, only a restricted use.

I should like to contradict most empatically the statement of your correspondent that "semi-coke" (including presumably coalite under this term) is extremely friable and disintegrates during transportation. I have no concern at the moment with the semi-cokes of other low temperature processes, as they are only of theoretical interest, but coalite is not friable at all. It is an extremely hard and porous solid, which not only makes far less breeze than coke, but actually travels better than coal itself, as can be seen by anyone at Marylebone Station, where hundreds of tons have arrived from Barnsley during the last few months.

In my opinion, any process involving briquetting is not a practical proposition, especially in competition with a non-briquetting method, and the coalite now being turned out by the new retorts is in any case harder than any briquette, and less trouble is taken in emptying the retorts than with a coke oven.—Yours, etc. D. BROWNLIE.

Manchester, October 31.

[The Editorial Note to which our correspondent refers was written primarily with the object of encouraging discussion on what is undoubtedly a subject of national importance. We gladly give publicity to his views, but would respectfully suggest that the interests of smokeless fuel advocates might in the end be better served by concentrating attention and even criticism upon the few apparent defects of the system than by the confident exposition of its admitted advantages. We have already recognised in fairly generous terms the enterprise of those responsible for the work at Barnsley and the valuable advances which have resulted. But we are not yet so completely assured as our correspondent appears to be that nothing more remains to be discovered or done.—ED. *C.A.*]

Chemical Properties of Insulating Materials*

By W. H. Nuttall, F.I.C.

(*Chief Chemist to the Vickers' Technical Research Committee on Insulating Materials*)

CONSIDERED in the light of the electron theory, the difference between an "insulator" and a "conductor" is rather a matter of degree than of kind, and the ideas underlying the theory of electrical conductivity are also applicable to insulation. According to the electron theory, the conductivity of any substance is dependent upon the presence and motion of electrically-charged "ions." Accordingly, a good insulator should

(1) not be capable of electrolytic dissociation, that is, it should be as free as possible from dissociated ions;
(2) it should not be capable of ionisation under an electrostatic stress;
(3) it should offer a high mechanical resistance to the passage of ions.

The Conducting Properties of an Electrolyte

1. An electrolyte in aqueous solution is a conductor by virtue of its state of ionisation—*e.g.*, dilute hydrochloric acid. But the same electrolyte dissolved in a non-ionising solvent—*i.e.*, a solution in which the molecules of the solute are in a state of association—is practically a non-conductor—*e.g.*, hydrochloric acid in chloroform solution. It is desirable, therefore, that an insulator should have its molecules in a high state of association, and whilst this point is probably of little value so far as inorganic substances are concerned, it is of great importance where we are dealing with organic materials for with such it is frequently possible to bring about a high state of molecular association through the process of polymerisation.

The Applicability of Ohm's Law

2. When an insulator is submitted to a difference of potential, Ohm's Law is probably only valid so long as the conduction is due to the ions initially present. So far as gases are concerned, if the voltage is increased progressively, the field will eventually become sufficiently intense to liberate electrons, when the resistance will rapidly fall, the molecular structure will be disintegrated and the insulator is said to have "broken down." It may, perhaps, be fairly assumed that the breakdown of liquid and solid insulators represents a not dissimilar process. In any case, a good insulator should consist of highly stable chemical compounds. They should be inert, neutral, saturated in a chemical sense, having no free valencies. They should not be affected either by a moderate rise in temperature or by the action of dilute acids and alkalies.

The Colloidal State Necessary for Insulators

3. Conductivity depends not only upon the presence of free ions, but upon their motion from molecule to molecule. If this is retarded, the conductivity is decreased. Resistance to ionic migration is a function of the internal friction or viscosity of the material under consideration. In other words, the material forming an insulator should be, as far as possible, in the colloidal state. Practical experience bears this out for, with the exception of air, all insulating materials are colloidal in character. This is in spite of the fact that the colloidal particles contained in a colloidal solution carry an electrical charge considerably higher than does the ordinary ion, which enables them to travel in an electric stream (electrophorysis), and bestows a certain distinctive electrical conductivity upon colloidal solutions which is additional to the conductivity of the dispersion medium of the electrolytes usually contained therein. Nevertheless, this distinctive conductivity is most evident in dilute solutions. In the colloidal form in which insulators are usually employed the resistance to movement offered by the great internal friction (viscosity) of the material reduces very considerably this inherent conductivity. It may be, however, that it is this special conductivity of colloid matter which is responsible for the charging or displacement current encountered in condenser work, the measurement of which under standard conditions gives the specific inductive capacity of the dielectric.

Consideration may now be given to some of the commoner insulating materials at present employed in the electrical industry in order to see how far they satisfy the three main desiderata for dielectrics outlined above.

Insulating Varnishes

Insulating varnishes are of two classes:—

(*a*) Spirit Varnishes, and
(*b*) Oil Varnishes.

A spirit varnish usually consists of a solution of shellac in methylated spirits, to which occasionally a certain proportion of an alcohol-soluble gum is added. Shellac is a colloid, and so satisfies condition No. 3. Its initial insulating properties are good. It is, however, not a very stable chemical compound, being easily hydrolysed by very dilute alkalies, Accordingly it has somewhat marked acid-forming properties, especially under an electric stress, which become evidenced by the greenness developed with cotton-covered copper wires which have been treated with a shellac varnish. The presence of much acid, thus produced, is liable to cause a rapid fall in resistance.

An oil varnish consists of a natural gum—*e.g.*, copal, which after heating to remove water and easily volatile matter, is dissolved in linseed oil, which itself has been submitted to a previous heat treatment. The weakest part of an oil varnish is undoubtedly the gum. The natural gums are not very stable compounds chemically. They are of the nature of organic salts or esters, and are easily hydrolysed. They have thus acid-tending properties, and it is rare to find an oil varnish which is not acid.

Rubber, Ebonite, Vulcanite, &c.

Rubber is a natural product of unknown composition. A somewhat similar material can, however, be prepared synthetically by the polymerisation of various unsaturated organic compounds, of which isoprene $CH^2 : C\ (CH^3),\ CH : CH^2$ may be taken as an example. Whilst such synthetic rubbers will probably never be of any technical importance, yet they afford some clue to the composition of natural rubber, which is undoubtedly a polymerised product. It is also a colloid.

Synthetic Gums.

Synthetic gums are becoming of increasing importance as electrical insulators, and their nature is not without interest in the light of the preceding theoretical considerations. The first of technical importance to be introduced was a condensation product of phenol (or creosol) and formaldehyde (or its derivatives). The condensation takes place in stages, a liquid, semi-liquid, and finally a solid product, being obtained according to the extent of the condensation. The solid product, if the condensation has not been taken too far, is soluble in alcohol, but on further heating a change takes place, the melting point gradually rises until an infusible gum results, which is then also insoluble in all solvents except strong alkalies or acids. The value of gums of this class is that they can be applied in an alcohol-soluble form, and after the solvent has been removed by evaporation, the soluble gum can be converted into the stable insoluble variety by stoving under suitable conditions. The insulated article will then withstand a temperature up to about 200°C., and is unaffected by oil. New types of synthetic gums are certain to be introduced sooner or later.

Appointment of Rubber Inquiry Committee

THE Secretary of State for the Colonies has appointed a committee "to investigate and report upon the present Rubber situation in British Colonies and Protectorates for the information of the Secretary of State for the Colonies, and to advise what remedial measures should be taken to improve the existing situation." The committee is constituted as follows: Chairman, Sir James Stevenson, Bart.; Mr. G. E. A. Grindle; Sir Stanley Bois; Sir Edward Brockman; Mr. E. J. Byrne; Hon. W. Duncan; Mr. Eric Milter; Sir Edward Rosling; and Mr. S. H. Leeke, O.B.E. (Seretary).

* Reproduced from "The Electrician."

Standardisation of Chemical Plant

Types of Filterpress Plates

A REPORT has just been issued by the Joint Committee of the Association of British Chemical Manufacturers and the British Chemical Plant Manufacturers' Association which has had the standardisation of Filterpress Plates under consideration. It states that as a result of the questionnaire which was sent to all members of the Association of British Chemical Manufacturers and to a number of others known to be large users of filter presses, details of over 800 cast iron presses were collected. The range of sizes was very large and varied, but the majority fell into one of four very definite groups, namely, 18½ in., 25 in., 32 in., and 38 in.; these were, therefore, adopted, and include 67 per cent. of the total number of presses reported.

It was decided that the following details should be standardised: Size of plate and cake (measured on outer and inner edges of joint surface), diameter and centres of side bars; size and position of wash and feed passages; size and nature of attachment of feed cocks, wash cocks, filtrate taps, and height of press (clear height between floor and bottom of plates).

The following are to be left to the discretion of individual manufacturers, namely, type and details of closing gear, fast and loose heads and standards, supports for side bars, character of filter surface and style of handles of plates or frames.

For the present it is proposed not to go beyond the following types in common use:—(*a*) Recessed plates, centre feed, non-washing; (*b*) plate and frame, top feed, washing pattern, internal lugs; (*c*) plate and frame, side feed, washing pattern, external lugs.

After careful consideration the committee are convinced that a distinct economy with increased efficiency in washing is to be obtained in many cases by the provision of a rib or flange about ½ in. deep round the interior of the frames of washing presses on the wash water outlet side, and it is proposed that this be a standard arrangement. It is further proposed that all filtrate and air cocks should have "cleaning type" nozzles, and that facings should be the same for both. All cocks over 3 in. are to be of the flanged type, while those under this size are to be screwed, but may be fitted with loose flanges if desired. All flanges are to be drilled to British standard table No. 2.

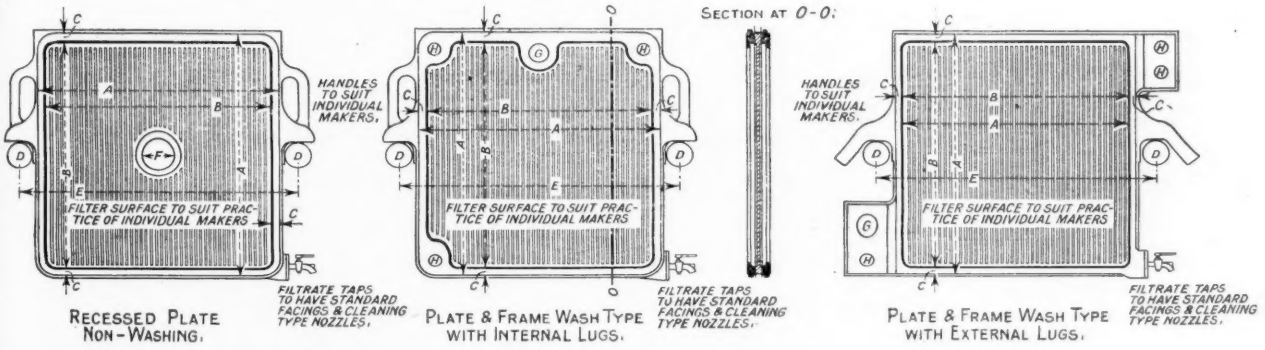
The accompanying plan, L.H. 3184, and table give the principal dimensions recommended, but detail drawings of all types and sizes proposed are available and will be sent on application.

The above proposals of the committee, together with drawing L.H. 3184 and the following questionnaire, have been circulated to all the firms previously approached who showed any interest in the matter:

(1) Do you agree with the types proposed for standardisation?
(2) Is the range of sizes sufficient for your requirements?
(3) Are you in agreement with the four sizes proposed?

The committee will welcome any helpful criticism and comment from any interested parties.

Types of Plates


SECTION AT O-O.
HANDLES TO SUIT INDIVIDUAL MAKERS.
FILTER SURFACE TO SUIT PRACTICE OF INDIVIDUAL MAKERS
FILTRATE TAPS TO HAVE STANDARD FACINGS & CLEANING TYPE NOZZLES.
RECESSED PLATE NON-WASHING.
PLATE & FRAME WASH TYPE WITH INTERNAL LUGS.
PLATE & FRAME WASH TYPE WITH EXTERNAL LUGS.

General Dimensions

Parts.	Reference Letter.	Nominal Size of Press. 19 in.	25 in.	32 in.	38 in.
Outside of plate (measured to outer edge of tooled rim)	A	18½ in.	25 in.	32 in.	38 in.
Size of cake (measured to inner edge of tooled rim)	B	17 "	22¾ "	29⅝ "	35½ "
Width of rim	C	¾ "	1⅛ "	1 5/16 "	1¼ "
Dia. of side rods	D	2½ "	3½ "	4 "	4 "
Centres of side rods	E	23⅜ "	30⅜ "	37¼ "	44 "
Dia. of feed passage in recessed plate	F	3 "	4 "	4 "	5 "
Dia. of feed passage in plates and frames	G	1¼ "	1¾ "	2⅛ "	3 "
Dia. of wash and air passages	H	1⅛ "	1½ "	1¾ "	2 "
Clear height from floor to underside of press plates (minimum)		19 "	21 "	24 "	24 "
Dia. of feed valves, plate and frame	*	1½ in. Screwed	2 in. Screwed	2½ in. Screwed	3½ in. Flanged
Dia. of wash valves, plate and frame	*	1¼ in. Screwed	1½ in. Screwed	2 in. Screwed	2 in. Screwed
Sizes of filtrate cocks		⅝ "	⅝ "	⅝ "	⅞ "

* Screwed valves may be fitted with loose flanges.

The British Association of Chemists

Annual General Meeting in Manchester

THE annual general meeting of the British Association of Chemists was held at the Midland Hotel, Manchester, on Saturday, October 29. Prof. J. W. Hinchley presided, and there were about 150 members present.

Review of the Year's Work

The Report of the Council for the year ending September 30 showed that satisfactory progress had been made, despite the unfavourable economic conditions which had existed. Much useful work had been accomplished, and with the return of any reasonable trade activity a period of steady advance might be confidently anticipated. During the year 205 new members had been elected, eleven had resigned, and the losses due to death amounted to three. The total membership was now 1,344 as compared with 1,153 at the beginning of the year. It was hoped in the near future that the position of the Association would be still further trengthened by the acquisition of a large number of chemists who were still outside the ranks of the Association. The subscription still remained at £1 1s., but many members who were in a position to do so voluntarily subscribed an extra half-guinea, thus making it possible for the Association temporarily to tide over a period of financial stress.

Appointments and Public Questions

The work of the Appointments Bureau had been necessarily affected by the acute depression in the chemical and allied industries. Since its inception the Bureau had received applications from ninety-five members, of whom forty-eight were actually unemployed; twenty-two members had found employment, and, in addition, at least three others had received appointments through the personal influence of other members. There were at present sixty names on the register, of whom thirty-six were returned as without employment. Further extensions of the scope and activities of the Bureau were contemplated. Advice on legal matters affecting agreements had been given to a number of members with satisfactory results.

As a result of exhaustive investigation by a sub-Committee, it had been found that the institution of a set service agreement was impracticable. A report had, however, been prepared which would prove useful to members when their agreements were under consideration.

The Association, being registered under the Trade Union Acts, 1871-1917, had been brought to the notice of the Ministry of Labour and a request made for invitation to any conferences called in connection with the formation of new Whitley Councils in industries in which chemists were concerned. The President of the Board of Trade was approached, both by correspondence and by means of questions asked in the House of Commons, on behalf of the Association, by Capt. W. E. Elliot, M.P., with a view to securing direct representation on the Development Committee set up under the Dyestuffs (Import Regulation) Act, 1920. The President of the Board of Trade was unable to afford representation to any technological associations, but the action of the B.A.C. undoubtedly caused the appointment of the Committee to be expedited, and the publicity given to the questions would be of value to the Association.

Action was also taken in regard to the new regulations governing manufactures and processes carried on in chemical works, and additional proposals were brought to the notice of the Secretary of State for the Home Department. The Association, however, was informed by the Home Secretary that he was unable to put forward their proposals, as the new regulations, as published, went as far as was reasonably practicable at the present time.

The Association had been elected to membership of the Manchester Chamber of Commerce, and useful work was anticipated through the influence of the representatives appointed.

Initial organisation for the formation of Guilds within the Association had been proceeded with, and draft bye-laws had been approved by the Council. Guilds for the dyestuffs making and textile industries had been inaugurated.

At the invitation of the Commissioners of Inland Revenue a Joint Committee of the British Association of Chemists, the National Union of Scientific Workers, and the Institute of Chemistry had undertaken the formulation of definite proposals as to allowances for income tax abatement in respect to expenses incurred by members of those bodies in the course of their employment.

Defining the Term "Chemist"

A special sub-committee had considered the question of a legal redefinition of the term "chemist." The question was found to be intimately connected with the questions of technical education and the ultimate determination of the "B" qualification which formed the subject of an article in the Proceedings of the Association on July 23. The Council was of the opinion that the time had not then arrived to fix the termination of the "B" qualification for membership, but the matter would be reconsidered at the commencement of the coming year. It was proposed that efforts be directed to secure legal redefinition by co-ordinated action between the various bodies affected, and the Committee were now working towards that end. The subject was an extremely difficult one, and progress must necessarily be slow.

The drafting of an efficient scheme for Technical School training had been undertaken by the Education Committee, as the result of a request from a number of junior members for guidance on a course of training in chemistry to be taken at evening classes, which would be considered as of sufficient standard to enable them to sit for the professional qualifying examinations. Co-operation had also been invited by the education authority of a northern town in the formulation of such a scheme for local adoption.

Representation on the Local Advisory Council for Technical Education constituted under the Education (Scotland) Act, 1918, had been accorded the Association by the Edinburgh Education Authority, and representation had been promised by other authorities on the reconstruction of their Councils next spring.

Relations with Other Bodies

Relations between the Association and various other scientific bodies had been of a cordial and harmonious nature. The proposals formulated early in the year for amalgamation with the National Association of Industrial Chemists were exhaustively considered by a joint committee of both bodies. After an impersonal analysis of the membership of the two Associations had been made, the Committee, in view of the peculiar constitutions of both bodies, was unable to recommend any proposals for immediate amalgamation. Proposals for a closer working with the National Union of Scientific Workers were being investigated at the present time. Matters, however, were only in a preliminary stage, and no pronouncement could be made at present.

The Association had become a subscribing member of the Labour Research Department. This course had been taken purely for information purposes, and in no way indicated a change from the policy of retaining a perfectly free hand in political matters. The Council, with very great regret, had to announce that in April last Dr. Francis W. Kay was reluctantly compelled to resign office as hon. registrar. The Council desired to place on record its appreciation of Dr. Kay's services to the Association, particularly in the arduous and difficult work involved in the Association's initial organisation. Increased efficiency had been effected by the holding of full day council meetings in Manchester at intervals of two months instead of the monthly meetings at Derby, and the organisation was being improved still further by a greater degree of centralisation in the work of the Association.

Business of the Meeting

The President, in opening the proceedings, said that the Association was now perfectly well established, and that the executive work done by the Council was greater than ever. They did not as yet embrace a sufficient number of chemists within their ranks to make them a formidable force in political and other quarters, but this was a position which would be remedied in time. In the beginning of such a movement as theirs the motive which inspired its promoters was one of public spirit and a desire to benefit the workers of the industry as a whole. This was at present their position. Later on, when their position was firmly consolidated chemists

would probably join the Association more from the point of view of individual gain, either of status or pecuniary emolument or both. One of the difficulties that most Associations were experiencing at present was the question of funds. In the case of such an Association as theirs the real benefit to members was often not apparent on the surface. For instance, they would notice in the Report a reference to service agreements, and having some knowledge of the work done by the Council he felt very sincere gratitude for the efforts they had made to solve that problem. It was possible that in the near future they would be able to obtain the services of a barrister-at-law who would deliver a number of lectures upon the legal aspect of these agreements. There had also been negotiations with the Inland Revenue authorities with respect to income tax abatement for subscriptions to the B.A.C., and also for damage to clothing sustained in the course of members' duties at the works. These negotiations were still proceeding.

Should the Subscription be Raised?

The financial report, on the motion of Mr. Morris, seconded by Mr. Gardner, was adopted. The general account showed a deficit on the year's working of nearly £100. The Association was solvent, but at the present rate of subscription was not self-supporting. The subscription was probably the lowest of any professional association, and there was no reserve fund to fall back upon.

Mr. Pomfrey moved, and Mr. Hamilton seconded, "That it be a recommendation to the Council that the subscription be increased to two guineas per annum."

A long discussion took place, in which Messrs. Boodson, Millington, Swindells, Best, Kay, Duncan, Gardner, and Harrison took part. The general feeling appeared to be that, having regard to the amount of unemployment among chemists and the possibility of compulsory contributions to the proposed Unemployment Benefit Fund it was inadvisable at present to press for an increase of subscription. In the result, the proposer and seconder consented to modify the motion so as to make it a recommendation to the Council to consider what increased subscription was needed to make the Association self-supporting, and this was carried unanimously.

Election of Officers

The following were elected officers of the Association for the following year:—

President.—Professor J. W. Hinchley.
Vice-President.—Mr. F. Scholefield.
Hon. Registrar.—Dr. David Bain.
Hon. Editor.—Mr. R. Brightman.
Hon. Treasurer.—Mr. H. E. J. Cory.
General Secretary.—Mr. S. Reginald Price.
Auditors.—Messrs. Hughes and Allen, London.

Unemployment Benefit Scheme

Mr. Harrison explained at length the objects and provisions of the Unemployment Benefit Fund scheme, full particulars of which were published in THE CHEMICAL AGE of October 22. According to the advice of their actuarial adviser it would probably be necessary to increase the amount of contributions, and the matter was being further considered by the Council. The present rate of unemployment of chemists was from 2½ to 3 per cent. of those engaged in the industry. Their actuarial adviser was preparing a supplemental report for the consideration of the Council.

Inter-Relations with Other Societies

Mr. W. E. Kay referred to the harmonious relations existing between the Association and the National Union of Scientific Workers. Both bodies were desirous of assisting one another. The whole point was how this could best be done. Two clear lines of action had been suggested, each of which had its supporters, and also to some extent its opponents. The first proposition primarily carried with it the retention of the individuality of the two Associations and the formation of a conjoint Board, acting for both, and to a very large extent taking the place of an individual Association, but without the actual destruction of the Associations as units. The second proposition was that the B.A.C. should to some extent merge its identity in the general body of the Union of Scientific Workers, and reappear as a section of that body. In either case the N.U.S.W. would reorganise itself as a body including all scientific men who were also workers, and would have within itself constituent sections or bodies of which the B.A.C. would be one. A very strong claim had been made for the adoption of the second proposition on the ground that the N.U.S.W. had already within its ranks a substantial number of chemists.

After discussion, in which Dr. Kay and Messrs. Morris and Cottrell took part, the matter was deferred without any definite motion having been proposed.

The business proceedings concluded with votes of thanks to the officers for their services during the past year and to the President.

The Annual Dinner

Professor J. W. Hinchley presided at the annual dinner, which was held at the Midland Hotel. The guests were Professor F. L. Pyman (Manchester University), Professor Bairstow (President of the N.U.S.W.), and Major Church (General Secretary of the N.U.S.W.)

In proposing the toast of "The B.A.C." the President said that no true citizen could regard such Associations as being completely sufficient in themselves. If the B.A.C. ruthlessly pursued its own ends, namely, the material benefit of its members, they might make mistakes. Their problems must be contemplated from the point of view of the citizens at large. The mediæval guilds set out to accomplish much the same kind of objects as those within the purview of the B.A.C., but they eventually fell upon evil days through pursuing their own interests too keenly and overlooking those of their fellow citizens generally.

In responding to the toast of "Kindred Organisations," proposed by Mr. F. Scholefield, Professor Bairstow referred to the co-operation of the B.A.C. and the N.U.S.W. during the past year in matters affecting their mutual interests. In political affairs numbers and influence counted for a great deal, and there would be great advantage in the establishment of some small central body which could say, upon matters affecting the interests of scientific workers in general, "We represent 90 per cent. of the scientific workers of the country." (Cheers.) Probably neither the B.A.C. nor the N.U.S.W., as a separate section, could contemplate seriously the supporting of a Member of Parliament, and yet he felt that they should, as the National Union of Teachers had done, have someone in Parliament who could represent them. (Cheers.)

Mr. S. R. Price, general secretary of the B.A.C., proposed the toast of "The Universities," coupling with it the name of Professor Pyman, who responded.

Major Church, general secretary of the N.U.S.W., proposed the health of the President and the proceedings closed.

Lemon Powder Prosecution

A SUMMONS was heard by the Kingston magistrates on Monday against the Watford Manufacturing Co., Limited, Victoria Works, Watford, for applying a false trade description to goods purporting to be glass lemon "produced by a new scientific process of concentrating the actual lemon."

Mr. E. Hinks, county analyst for Surrey, said the lemon powder contained 7 per cent. of tartaric acid, 91.5 per cent. of cane sugar, and 1.5 per cent. of moisture with traces of artificial colouring matter, and of flavouring essence. The powder contained no citric acid, which was the acid natural to lemon-juice. The colouring matter was not that of lemons, but was an artificially prepared dye. The flavouring essence might have been prepared from lemons. He admitted that a drink made with the powder was quite harmless. It would be possible, he said, to manufacture a powder by concentratin the actual lemon.

For the defence, the chief chemist of the Watford Manufacturing Co. stated that the flavouring in the lemon powder was obtained from "zest," which contained all the constituents which could be chemically identified in the whole lemon.

The magistrates imposed a fine of £20.

Finsbury Old Students' Magazine

THE October number of the Finsbury Technical College and Old Students' Magazine contains a new feature entitled "Old Students' Doings," which, as its title implies, is designed to help members to regain touch with fellow-students of the College. We are informed that copies of the magazine may be obtained from the editor, Mr. W. B. Thompson, "Elleray," Regent Road, Altrincham, Cheshire.

Society of Chemical Industry

Liverpool Section

AT a meeting of the Liverpool Section of the Society of Chemical Industry held on October 28, in the Muspratt Lecture Theatre, Liverpool University, Dr. G. C. Clayton gave an address on "The Effect of the War on the Heavy Chemical Industry."

The war, said Dr. Clayton, emphasised the vital necessity to any country of its chemical industry, but it was equally vital in times of peace. No up-to-date works could now afford to be without its chemist. The first effect of the war on the British heavy chemical industry was the enormously increased demand for concentrated vitriol and oleum. The pre-war output of a few hundred tons per week was raised to the astounding figure of 7,000 tons for each product, the high level for concentrated vitriol being reached in eighteen months. Amongst the alterations in chamber manufacture was the abandonment of nitre pots and the substitution of ammonia oxidation plants. Other heavy chemicals in big demand for war purposes were caustic soda and chlorine. The two main processes operated in this country were the mercury process by the Castner Kellner Co. and the Gibbs diaphragm process by the United Alkali Co. The products in both these processes were chlorine, hydrogen, and caustic liquor, which latter was concentrated similarly to causticised ammonia ash; increasing use was, however, being made of multiple effect evaporation and similar devices.

Bleaching powder was still produced in Weldon chambers, Hasenclever cylinders, Deacon blocks, and more recently in two types of mechanical cylinders designed by Castner Kellner and the United Alkali Co., but with strong electrolytic chlorine the old Weldon chambers still held their own. Chlorates, as a result of the higher labour and fuel costs, were now only made by direct electrolysis of the chlorides, and consequently calcium chloride, which was a by-product, had to be made from the ammonia soda still liquors.

There had been very slight changes in the ammonia soda process, which, except for certain mechanical details, was so perfect in its efficiency that little real alteration was possible. Latterly, however, a combination had been suggested whereby synthetic ammonia could be produced with an ammonia soda plant in such a way that the ammonia would be taken out of the process as ammonia chloride.

During the war enormous quantities of ammonium nitrate were made at the ammonia soda works, and Dr. Clayton felt that Brunner, Mond & Co. were to be congratulated on the success they had achieved in working out a double decomposition which had previously eluded many investigators. It must, however, be acknowledged that this country was still dependent on overseas raw materials, and it was therefore very desirable that we should have adequate resources for the manufacture of synthetic ammonia.

Referring to the present state of the fertiliser industry, the lecturer said the Germans had recently evolved a process for the manufacture of urea on a commercial scale from synthetic ammonia and CO_2. This gave them a product rich in nitrogen which they hoped would compete successfully with ammonium sulphate. It was too early to say whether it would substantiate the claims made for it, but it was certainly a possible competitor, and, as such, would no doubt be investigated in this country.

Edinburgh Section

The opening meeting of the winter session of the Edinburgh section of the Society of Chemical Industry was held in the hall of the Pharmaceutical Society of Great Britain, 36, York Place, on October 25, Dr. H. E. Watt, president, in the chair. Dr. Lander, the secretary, submitted a report on the proposal to admit associate members to the Society, and suggested the status that such members would have. He also gave particulars regarding the adoption of such a group in connexion with the Glasgow Society.

Mr. J. R. Hill also referred to the associateship of the Pharmaceutical Society, and pointed out that in their instance they had found the associates became feeders to the Society itself. He moved that the Society should create an associate group and that the committee should seek powers to elect associates on the same terms as the Glasgow Society did; this was agreed to.

Mr. W. Williams, North British Rubber Works, vice-president, then took the chair, while Dr. Watt delivered his presidential address. The subject of the address was "Industry and Some National Financial Problems." Dr. Watt demonstrated how the war had affected the industries of this country and how the hopes and anticipations which had been entertained of securing the trade of our late enemy had been falsified. In conclusion he emphasised the fact that we could only achieve industrial and economic salvation by faith and hard work.

Mr. J. R. Hill, who proposed the vote of thanks to Dr. Watt, referred to the fact that five or six thousand chemical substances had been scheduled under the Safeguarding of Industries Act, but from a reply which had been given in the House of Commons it would seem that the Board of Trade had construed the Act as one that gave them no discretion at all, and had assumed that they must schedule every chemical substance used in analysis. He did not think that was the intention of the legislature.

Glasgow Section

A meeting of the Glasgow Section of the Society of Chemical Industry was held on October 27 in the Engineers' and Shipbuilders' Institute, Glasgow. The chair was taken by Mr. S. H. B. Langland. Mr. R. F. Stewart read a paper entitled "Leaves from the Notebook of a Research Chemist," in which he contrasted the industrial chemist with the academic worker. The former, he said, had to work on a specific subject with a view to a definite solution of economic value, while the latter was in the position that he could choose his own subject. The technical worker often obtained results of real scientific value and interest. Rule of thumb laid the foundation of great scientific processes, and it was necessary for the theorist to tread warily when he attempted to deal with many facts and processes for which even now no scientific explanation was available.

The lecturer discussed the scientific principles underlying the study of emulsions, including milk and soap solutions, and concluded by referring to the tropical and sub-tropical possessions of Great Britain and the great importance of developing them for the benefit of the Empire.

Pulverized Fuel

To the Editor of THE CHEMICAL AGE.

SIR,—I am pleased to note your remarks on this subject in this week's issue of your journal, and I quite agree with you that there is no reason why this system of handling solid fuel in this country should not make rapid steps. The writer is in constant touch with the progress made in America in this system, and from the latest information received from that quarter they seem to have overcome all the possibilities of explosions, and have now a very fine system known as The Quigley Powdered Fuel System. I understand that this system has been developed as the result of twenty years' experience in the burning of powdered coal, lignite, and peat. In many cases this method has replaced other fuel systems, including hand and stoker fired coal, producer gas, natural gas, and fuel oil, and has effected large savings in both fuel and labour. In actual practice the Quigley system has proved more economical than oil or gas on a B.T.U. basis. In the Quigley system they claim from an economic operating point of view that powdered coal is about 38 per cent. cheaper than producer gas, 120 per cent. cheaper than natural gas, and 219 per cent. cheaper than fuel oil. The writer will be pleased to give any of your readers any further information on the subject.—Yours, etc.

H. T. WATSON,
Chemical Engineer.

Fairfield Road, Widnes,
October 29.

Zinc Concentrates

THE Board of Trade announce that they have instructed their agents in Australia to ship a supply of Broken Hill ZINC CONCENTRATES to this country, and will be prepared if desired to maintain supplies to meet the immediate requirements of smelters in the United Kingdom. In order to enable smelters to restart their works, the Board will be prepared to consider offers for these concentrates delivered at works. Offers for future deliveries over a period will also receive consideration. The British Metal Corporation Ltd., of 3, Abchurch Yard, London, E.C.4, have been appointed the agents of the Board of Trade for all business relating to concentrates for disposal in the United Kingdom, and all enquiries as to prices, terms, etc., should be addressed to the Corporation.

Zirconium: The "Mystery Metal"

Investigation into Preparation and Uses

On account of various mysterious properties and uses that have been attributed in the popular mind to zirconium, sometimes styled the "mystery metal," an investigation regarding the preparation and uses of metallic zirconium and its salts has been conducted by the U.S.A. Bureau of Mines, and the results have just been made public.

The compounds of zirconium have numerous important uses and more uses will doubtless be found. Investigations in recent years have indicated that sintered or coherent zirconium metal is very resistive to acids, that it can be used for electrodes, and that it probably will find metallurgical uses. A steel containing zirconium has been proposed for use in armour plate and automobile parts, and nickel-zirconium alloys have been suggested for high-speed cutting tools and for cutlery. Numerous articles in scientific journals have recommended the use of zirconium oxide as a refractory, an abrasive, a pigment in paints, and an opaquing agent in enamel ware. The salts have been used in the textile industry as a mordant or dye-fixing agency, and also for weighting silk.

Zirkite firebrick is used for furnace lining as well as for other purposes where a refractory having a low coefficient of expansion, high melting point, and maximum resistance to slag corrosion is demanded. Although zirconium oxide has not proved satisfactory for gas mantles or for arc lamps, it has been used for polishing powders, insulators for both heat and electricity, and with fair success in the Nernst lamp. Being absolutely non-poisonous, zirconium oxide is finding a use in paints and lacquers, where its resistibility to physical and chemical agents is proving highly valuable. As an abrasive, zirconia, zirconium silicide, and zirconium carbide are suggested for a variety of uses, the carbide particularly as a substitute for the diamond in cutting glass. Zirconium oxide, because of its non-toxic nature, is used in place of bismuth, nitrate, or carbonate in Röntgen-therapy. It is also said to have some medicinal value. Zirconium oxide and nitrate have been suggested for use in the extraction of oxygen and nitrogen from the air. There have also been statements to the effect that the oxide may find use as a filler in the manufacture of rubber goods.

In flash lights, amorphous zirconium, mixed with certain oxidising agents, burns with a bright light, but it is doubtful whether the metal would be cheap enough to use in place of the usual material. Coherent white zirconium metal, on account of its acid-resisting properties, has been suggested as a substitute for platinum in certain cases. Its alloys have been suggested in the manufacture of rust-resisting apparatus. Crucibles prepared from zirconium oxide were proved in the experiments of the Bureau of Mines to be superior for high temperature work to any crucibles procured on the market.

Principal Deposits

Zircon is found in considerable amounts in many placer deposits derived from disintegration of granitic and pegmatic rocks. The best-known deposits in the United States are near Green River, Henderson County, N.C., and in the Wichita Mountains, near Cache, Okla. Zircon is found most abundantly in certain syenites of Norway, and occurs in crystalline limestone at Grenville and elsewhere in Canada. Dana states that zircon occurs in various localities in North America, including Litchfield, Md.; Essex County, Orange County, and in St. Lawrence County, N.Y.; near Reading, Pa.; abundantly in the gold sands of Burke, McDowell, Polk, Rutherford, Henderson, and other counties in North Carolina, with astrophyllite, &c., in the Pike's Peak region in El Paso County, and at Cheyenne Mountain, Colo. In California and elsewhere it occurs in gold-bearing gravels.

Baddeleyite (brazilite) is found in large deposits in Sao Paulo, Brazil. This mineral has also been identified in Ceylon, Sweden, Italy, and Montana. Samples of zircon sand from Pablo Beach, Fla., have been investigated, and recently as much as 3 per cent. of some of the auriferous sands of Idaho has been found to be zircon mixed with some monazite.

In Brazil, which is an important source of industrial ores, it is difficult, owing to the hardness of the ore, to drill holes for explosives, and in handling large amounts resort is had to quite primitive methods. A large fire is built against an exposed face of the ore and kept burning for several hours, at the end of which time water is thrown upon the ore, which produces fracturing of the mass, permitting it to be sledged into pieces easily handled by one man. Most of the mines are many miles from the railroad. Horses for other than saddle purposes are practically unknown, and the ore is transported to the railroad station by ox-carts carrying about 1 ton each. These carts are of the crudest character, having large, solid, wooden wheels, some 4 ft. in diameter and 6 in. in thickness. From twenty to thirty oxen are generally required for each cart, owing to the mountainous roads.

The results of the investigations of the Bureau of Mines are available in Bulletin 186, "Investigations of zirconium with especial reference to the metal and oxide," by J. W. Marden and M. N. Rich, which is distributed by the Superintendent of Documents, Washington, D.C., at a price of 25 cents.

The Rate of Coal Carbonisation

Experience with Continuous Vertical Retorts

At a meeting of the Newcastle-on-Tyne Section of the Society of Chemical Industry held on October 26, Dr. J. T. Dunn presiding, Dr. G. Weyman read a paper on "The Rate of Carbonisation of Coal," in which he gave an account of various results obtained by observing the rate of gas yield when a known amount of coal was placed in a steel tube and plunged in a certain quantity of heat contained by molten copper in a calorimeter. The influence caused by the size of the coal particle is shown in a series of plotted curves. Taking all the grades of coal used, the lecturer found that the curves were very regular, indicating that although the carbonisation was rapid the penetration of heat was even. Not only did the smaller grades give a very slow rate, but the rate reached a maximum rapidly and tailed off quickly. As the size increased, the rate of gas evolution increased, the exception being that the size 3-4 came considerably lower than the size 4-8.

Dr. Weyman said that his practical observation had proved that a retort charged with English coal in pieces 1 c.c. in size distilled the same weight in three hours as other retorts in the set still distilled in four hours. When dust was mixed with nuts the distillation was only slightly retarded. Large pieces and heaped up dust, however, produced disastrous results. He considered, when dealing with the carbonisation, that it was the size of the interspaces rather than the total free space which was important.

Dr. Weyman's conclusions, particularly regarding carbonisation carried out at high rates were summed up as follows: (1) The transference of heat to the interior of the charge is most rapidly affected by the gases evolved. Conduction is relatively slow and radiation still slower. (2) The transference of heat by gases is practically stopped by the formation of the impervious plastic layer which forms when coals which give adherent coke are heated. (3) The size of particle is most important as interfering with the formation and continuity of this plastic layer. The larger the size of particle the less continuous the plastic layer and more rapid is the carbonisation. (4) The increase of rate due to increase of size is limited by the necessity for a preliminary heating of a small layer of coal by conduction, as radiation is ineffective. This preliminary heating can only be effected by contact of coal with heating surface and necessitates a small size of particle in comparison with the diameter of the retort. (5) Thus there is a critical size corresponding to a maximum rate for each coal, the diameter of the retort being fixed. (6) With coal containing all sizes, the rate depends very largely on the difference between the maximum and minimum size, the more irregular the mixture the better the result. Relatively small amounts of dust affect the rate very adversely; more so when the coal possesses an even graduation in size. (7) The result of mixing different coals is, generally speaking, to give a mean of the rate of component coal, but can only be foretold by an examination of the particular coals, having regard not only to the constituents of the coal substance but also to the size of coal particles mixed. (8) For any size, the following classes of coal are arranged in ascending order of maximum rate of carbonisation, there being a gradual transition from class to class—coking coals, gas coals, cannels, anthracite and non-coking coals.

An interesting discussion followed in which Dr. W. B. Davidson, Dr. Lishman, Professor H. Louis, Professor Cobb, and Messrs. H. Dunford Smith, F. H. Walker, and F. Cooke took part.

Society of Dyers and Colourists

Manchester Section

THE first meeting of the 1921-1922 session of the Manchester Section of the Society of Dyers and Colourists was held in the Lecture Hall of the Manchester Literary and Philosophical Society, on Friday, October 21.

Professor E. Knecht (who presided over a large gathering) commented on the fact that cotton tendered by oxidising agents gave reactions which were almost identical with those given by cotton tendered by dilute sulphuric acid. He had been engaged, in collaboration with Mr. F. P. Thompson, in endeavouring to elucidate the cause of the remarkable action of this particular acid, and had found that cotton which had been tendered by it, and showed the characteristic methylene blue test, retained a small amount of sulphuric acid in combination which could neither be removed by boiling with water nor even by boiling with caustic soda. This afforded a ready means of differentiating between the two causes of tendering.

In a paper on this subject Mr. Horace Lowe, F.I.C., showed that the mercerising operation revised and enhanced the value of the spinning operation when conducted under specified conditions. The nature of the organic interrelatedness of the two processes of spinning and mercerising was discussed at length, and a satisfactory explanation was adduced to account for the great enhancement of the yarn values. When mercerisation was applied to spun yarn it was necessary to conform to the spinner's natural demand that the product should be returned as nearly as possible to length. In some instances a request was made that the length should be kept, and some firms endeavoured to do this.

In the first days of mercerising to spinners' reeled length he noticed immediately that the fineness of thread observable in a mercerisation at once resolved itself into a real change of counts. This was a new technical feature. Spinners generally were at first inclined to ignore the problem until the reader of the paper showed that a change of colour was involved. Ultimately the weaver of the goods rearranged his formula for colour, and he got even finer yarn at the price of 60's that was really 70's. This feature alone was sufficient to show that mercerisation to length, with no question of stretches (if anything it was shorter length when naturally dried) produced a finer count and altered the spinning.

What Mr. Lowe desired to show was that if there was a gain in the test, after mercerisation, this gain, in addition to the alteration of counts, might have produced the equivalent of a spinning test. The significance of a change of quantities could only be interpreted in one way, *i.e.*, it was done during the mercerising process. The alteration, for instance, in counts, and the production of an 18 per cent. difference in fineness, together with the levelling of the spinning, and the total height of spinning attainment, taken in conjunction, pointed to a spinning effect, which had the same result as very much better spinning right through. He had been steadily following up this feature, and searching for grounds in the mercerising operation that would give this effect along with the lustre, a ground that could not be an outside source of explanation, but an action which was capable of changing the composition or density of the spiral configuration of the fibres, because anything other than that could not yield spinning effects. With respect to mere diameter it was evident that there was a condensing action; the yarn, apart from the fibres, was denser. As the yarn got better the test became better, and as it got clearer it was better for the purpose and the mercerisation got clearer also. There was always a steady advance accompanied by the fact that there was no " wildness " of the state of the structure. The total of spinning increase on the bench test, which was the pull-out test, was from 14 to 25 per cent. It depended upon what spinners gave in the way of twist. In the course of mercerising there was a great change in all the spinning factors. There was an unloosening of the latch of the twist through the molecular change.

A very long discussion followed, in which Professor E. Knecht and Messrs. Scholefield, Harrison, Lomax, Hubner, and Higgins took part.

Leeds Junior Branch.

The second session of lectures in connexion with the Leeds junior branch of the Society of Dyers and Colourists opened with a smoking concert at the Hotel Metropole, Leeds, on October 25.

Import Licences for Dyestuffs

Colour Users' Suggestions for Improving Methods

FOLLOWING a meeting with the representatives of dyestuff users on the Dyestuffs Advisory Licensing Committee, the Colour Users' Association (Manchester) have issued a circular to colour users regarding methods of application for licences to import foreign colours. The following suggestions made by the Licensing Committee's representatives are endorsed by the Association as tending to more expeditious consideration of applications and to assist the Association's nominees in supporting applications and in seeing that licences are granted where the necessity of importation has been established.

In cases where there is admittedly no British equivalent, licences for reasonable quantities will be granted without challenge—either to users or to colour agents. It is in cases where it is claimed that a British equivalent exists that delay may occur. Users should, therefore, wherever possible, apply in their own name for their requirements, for the following reasons:—When a British made dye is offered as an adequate substitute for a foreign one, it rests with the British maker to prove that this product is actually a satisfactory equivalent. *Prima facie* evidence can be produced by laboratory tests, but finality can only be reached when the British maker demonstrates the quality of his production to the actual user, who must be satisfied that the British made colour will fulfil all requirements of his particular trade. This is impossible if the user does not disclose his identity.

In order, therefore, to assist your representatives on the Licensing Committee to press for the acceptance by the maker of the onus of proof, it is desirable that licences shall be applied for in the name of the actual users rather than through agents.

It cannot be too clearly impressed that, unless the necessity of importing a foreign dye can be demonstrated, licences to import cannot easily be obtained. It is, therefore, of great importance that applications should embody clearly defined reasons why importation is desired. General statements such as " This colour is required because of its good dyeing qualities " are not effective. Wherever possible the necessary qualities of the dyes should be specified, such as suitability for a particular process, solubility, fastness, shade, etc. In cases where British made dyes have been tried as substitutes and have been found unsatisfactory, delay will often be avoided if this is made known with a statement as to the respect in which the British dye is deficient, as to the date of trial, and as to whether the British maker has been advised of its unsuitability.

Where an application has been refused, and the suggested substitute of British make is found to be unsatisfactory, a further application should at once be made, stating as specifically as possible the shortcomings of British colour. In this connexion the Technical Advisory Committee of this Association can be of material assistance in strengthening the claims for a licence, and it is desirable that all such cases should be reported to the Secretary of the Association.

When a difference in price between the British and the foreign dye operates to the serious disadvantage of the user, the application for licence should be accompanied by a statement demonstrating the extent to which the user will be placed in a disadvantageous position by the refusal of a licence to import the foreign product.

In urging that the full influence of users should be brought to bear where the prohibition of import is placing users at a disadvantage and that these suggestions should be carried out by all users applying for licences, the circular points out that the Association has already been instrumental in establishing two leading principles in granting of licences—by arrangement with the Licensing Committee the onus of proof of quality is placed upon the maker, and as a *quid pro quo* the onus of proof of price being unduly disadvantageous is upon the user.

Chemical Workers' Strike Settled.

The strike of DUBLIN CHEMICAL WORKERS has been settled, the men affected having agreed to resume work on a reduction of 6s. per week. A further proposed reduction of 3s. per week will be arbitrated on later.

Chemical and Dyestuff Traders

Drawback on Re-Exported Goods

THE Chemical and Dyestuff Traders' Association, in their latest circular to members, state that they have been in further correspondence with the Customs authorities respecting the question of drawback in the case of goods which had already paid duty being afterwards re-exported. In the event of the goods being repacked and the original marks and numbers being removed, what proof, the Association inquired, would the Customs have and how could the Customs satisfy themselves as to whether the goods had or had not paid duty. Repacking, it was pointed out, had been one of the most profitable British industries, and if satisfactory arrangements were not made the business might pass from this country.

In their reply the Customs authorities stated that a memorandum giving in detail the procedure for claiming drawback on the exportation of goods which have paid duty under the Safeguarding of Industries Act was in course of preparation. The procedure would not preclude payment of drawback on goods which were not themselves changed in form or constitution between import or export, merely because they were repacked in this country. In such cases provision would be made for the acceptance of proof of payment of duty furnished by the production of officially stamped import invoices, and the keeping of stock accounts showing, *inter alia*, in respect of each description of article: (1) The stocks in hand on October 1, 1921; (2) the quantities since imported, giving the dates of importation and the amounts of duty paid thereon; and (3) the several quantities disposed of day by day, distinguishing the goods exported from those delivered for home use.

Drawback would not be payable on the export of an article containing a dutiable chemical or drug which in the process of manufacture of the article exported had been mixed with any other substance. If, however, the dutiable article was not mixed with any other substance, but merely changed its form in the sense that it had been compressed from loose powder into tablets without any admixture whatever, it would not be regarded as thereby forfeiting its title to drawback on exportation.

Merchants and the Key Industries List

In reference to the joint conferences recently held at the London Chamber of Commerce, the Association has issued a circular to members inviting them to specify the articles which they desire to have excluded from the list.

In the course of the discussion at the conference the case for the Association was stated at some length by Mr. F. T. T. Reynolds. He said that a number of important consumers' associations had been sounded on the question, and they were of opinion that by concerted action more might be accomplished than by each making representations on its own. There was (he said) every reason to believe that the most important users of chemicals and dyestuffs in this country were convinced of the necessity for action and were disposed to favour that action being of a concerted nature. The general feeling of those affected by the Bill was that it was ill-conceived, ill-considered, ill-digested, and ill-administered.

The experience of many of them with regard to the rulings of the Board of Trade and the experiences they had had in connexion with the action of the Customs and Excise authorities all indicated that those who were administering the Act had no clear conception of what they really had to achieve, nor any definite principles upon which to work, as they themselves did not understand some of the rulings issued. Moreover, rulings were issued from day to day, or from week to week, and they were sometimes vitiated by rulings of quite a different kind in the following day or week.

The administration of the Act was a flagrant contravention of the assurances given in Parliament when the measure was under discussion. It was then stated that it was not proposed to make the Bill a tariff measure, the main intention being to secure certain special chemicals being manufactured in this country upon a scale that would free us from dependence upon external supplies. They had some sympathy with that theory, but what they had to guard against was that in order to get a benefit of such a simple nature, and in regard to a comparatively small range of commodities, they did not place great and vital obstacles in the way of national interests.

Rubber Growers' Association Competition

IN announcing the full results of the recent competition fo new uses of rubber, the Rubber Growers' Association state that while the competition has not produced any suggestions which would appear to afford an opportunity for the realisation of the aims of the Association, *i.e.*, the exploitation of a new use which would be responsible for an immediate and marked increase in consumption, at the same time it is felt that among these suggestions there must be some which, when submitted to expert technical investigation, may prove to contain substance for feasible development. The Association has decided, therefore, to submit all suggestions received to a panel of qualified technical men of established repute in the industry, who will carefully consider the ideas. It is proposed to publish the result of these investigations in the form of a pamphlet for circulation to all rubber manufacturers, and it is not intended to wait until all the investigations are completed, but a preliminary report will be issued, followed by appendices as the work of investigation proceeds. A pamphlet giving full details of the competition and the awards may be obtained from the Rubber Growers' Association, 38, Eastcheap, E.C.

Tea Merchants and Eucalyptus

On Thursday, in the King's Bench Division before Mr. Justice Bray, the case of H. Tuck Mannell & Co, tea merchants, of the Minories, E.C., against the English, Scottish, and Australian Bank, Ltd., was mentioned. It was stated that the plaintiffs were seeking an injunction because eucalyptus had invaded their premises, which adjourned the bank, and had very much affected their tea, and caused their customers to complain. The defendants had undertaken to remove the eucalyptus from the present store, without admitting that it had done the damage, within six weeks. Counsel had agreed on both sides that the action should stand over so that the question of liability and damages could be determined together. His Lordship said that on that understanding the action would proceed in the usual way.

Dr. J. W. Richards.

IT is reported from the United States that Dr. Joseph William Richards, Professor of Metallurgy at Lehigh University, died at Bethlehem, Pa., on October 12 last. Dr. Richards, who was one of the foremost engineers in the United States, and who had an international reputation in various branches of metallurgical technology, was born at Oldbury in 1864, but he left this country when quite young, and spent the greater part of his life in the U.S.A. He wrote a number of books of which his "Metallurgical Calculations" and a "Treatise on Aluminium" are probably the best known. He was the first president of the American Electro Chemical Society, and became secretary in 1907, an office which he filled up to the time of his death.

Safeguarding of Industries Act

THE Board of Trade give notice that they have received a formal notice of complaint under section 1 (5) of the above Act from the Eastern and Russian Trading Co., of 8, Drapers Gardens, Throgmorton Avenue, E.C. 2, that Santonine has been improperly included in the lists of articles chargeable with duty under Part I. of the Act. The referee appointed by the Lord Chancellor will hear this complaint on Saturday, November 12, at 10 a.m., at the offices of the Board of Trade in Great George Street, London, S.W.1, and any persons directly interested in the matter should communicate immediately with the solicitors for the complainants, Messrs. Stephenson, Harwood & Tatham, 16, Old Broad Street, E.C. 2, or with the Board, as they may desire.

Government Contracts

THE following were among the Government Contracts let during September:—

WAR OFFICE.—*Paint, Dry Blue Prussian:* Burrell & Co., Ltd., Millwall, E.

HIGH COMMISSIONER FOR INDIA.—*Chloroform:* W. J. Bush & Co., Ltd., London, E. *Drugs:* F. W. Berk & Co., Ltd., London, E.C.; British Drug Houses, Ltd., London, N.; Burgoyne, Burbidges & Co., Ltd., London, E.; May & Baker, Ltd., London, S.W.

Chemical Matters in Parliament

Safeguarding of Industries Act

In reply to Lieut.-Commander Kenworthy, Mr. Young (House of Commons, October 25) said that he did not think it would be advantageous to open Customs depots in the principal inland towns to avoid the congestion at the ports owing to the holding up of goods under the Safeguarding of Industries Act.

Production of Invoices

Mr. Kiley (House of Commons, October 25) asked the Financial Secretary to the Treasury if he was aware that under the Safeguarding of Industries Act H.M. Customs were demanding the production of the original invoices and also two copies of the same; and whether he was aware that the preparing and production of these entailed a considerable amount of labour and cost, especially where the importer resided a long distance from the port, and was he prepared to accept the usual documents and bills of lading as evidence of the commodities and their value without putting the importer to this immense amount of work, especially in view of the reluctance of importers to hand over valuable trade information to forwarding agents and Customs officials?

Mr. Young said a second copy of the invoice was required only where goods were liable to the Reparation levy in addition to an *ad valorem* duty. The question whether this second copy could be dispensed with was under consideration. The production of the foreign supplier's invoice was essential for the proper charging of Customs duties leviable on an *ad valorem* basis, and he was unable to accept the suggestion that bills of lading or other documents would serve the purpose. This requirement was believed to be common to all countries which levied *ad valorem* Customs duties, and many of them prescribed a particular form of invoice which had to be certified by the supplier, as against the ordinary commercial invoice (not in any prescribed form) accepted in this country.

Revenue Collected under Part I

In a written reply to Sir K. Fraser, Mr. Baldwin (House of Commons, October 27) stated that the amount of revenue collected under Part I. of the Safeguarding of Industries Act from October 1 to 25 was £11,885.

Hearing of Complaints

Answering questions by Major Wood and Mr. Kiley (House of Commons, October 31), Mr. Baldwin said it was not intended that cases arising under section 1 (5) of the Safeguarding of Industries Act should be heard by the referee in public, but his decision would be published. Every facility would be granted to those interested to place their views before the referee, and if in practice it was found that there was a necessity for an additional referee, the matter would be considered. He could not say whether the referee would adjudicate upon questions arising in Scotland.

Formalities under Part II

Mr. Briant (House of Commons, October 31) asked what were the formalities which British traders had to observe, or what were the questions which it was necessary for them to answer, when applying for the issue of an Order under Part II. of the Safeguarding of Industries Act.

Mr. Baldwin said it was impossible to lay down any strict rule applicable to the varying conditions of different industries, except that applicants must make out to the Board of Trade a *prima facie* case that the conditions precedent to the reference of a complaint to a Committee, as set out in section 2 (1) of the Act, were complied with. Memoranda were sent to applicants explaining the procedure, and indicating the kind of evidence which it was desirable for them to submit in support of their complaints.

Foreign Names of Fine Chemicals

Replying to Major M. Wood (House of Commons, October 31), Mr. Baldwin said he was aware that a number of the names appearing in the lists of chemical products issued under section 1 (5) of the Safeguarding of Industries Act were registered trade names of German proprietary articles, but in the majority of such cases the equivalent chemical designation also appeared in the lists. It was open to British manufacturers in certain cases to manufacture and sell such products under the German trade names. The lists were issued to remove doubts as to the commodities covered by the particular headings of the schedule to the Act and for the convenience of traders.

Direct Export Orders

In reply to Mr. Kiley (House of Commons, October 31), Mr. Baldwin said he had no evidence that British merchants had adopted, on any appreciable scale, a suggestion by Continental firms that merchants in this country should despatch their export orders direct to the Continent.

Duty on Synthetic Camphor

Major Entwistle (House of Commons, October 31) asked the President of the Board of Trade whether imported camphor was exempt from duty under the key industries portion of the Safeguarding of Industries Act, whilst synthetic camphor, which was the only substitute available, and the supply of which regulated the price of camphor, was, in fact, subject to a duty; and whether he will consider the advisability of bringing in special legislation to remove anomalies such as this from the Safeguarding of Industries Act?

Mr. Baldwin said he was aware that ordinary camphor was not liable to duty under the Safeguarding of Industries Act. The remainder of the question was covered in the answer given to Mr. Kiley on October 18 (*see* THE CHEMICAL AGE, Vol. V., p. 493).

Reparation Dyestuffs

Replying to Major Barnes (House of Commons, October 31), Mr. Baldwin said the dyestuffs and intermediates requisitioned from Germany under the Reparation Clauses of the Treaty of Versailles were taken on the advice of representatives of the colour users. Owing to the trade depression which began later, the disposal of these quantities had been much more gradual than was then anticipated. The dyestuffs and intermediates still in stock were in good condition, and he was not aware of any complaints as to any deterioration in their quality. Such deterioration was not likely to occur except in the case of a very limited number of products. The prices obtained for reparation dyes had approximated as closely as possible to current market prices at the time of sale. A substantial part of the reparation dyes consisted of kinds not at present manufactured in this country.

Replying to further questions by Lieut.-Commander Kenworthy, Mr. Baldwin said that in view of the existing trade depression and the consequent limitation of demand, it had been thought inexpedient to exercise for the time being the full option on the current production of German dyestuffs under the Reparation Clauses of the Treaty of Versailles. This decision was not due to any representations from British manufacturers of dyestuffs. The quantities now taken were determined after consultation with the various interests concerned, and with the Dyestuffs Advisory Licensing Committee, and were based on estimates of requirements furnished by the representative organisation of colour users.

Magadi Soda Company's Claim

Mr. G. Barker (House of Commons, October 25) asked the Secretary of State for the Colonies whether, seeing that the Government during the late War took over the control of the railways and water supply in East Africa belonging to the Magadi Soda Co., Ltd., and that this property was of great assistance to His Majesty's forces in the campaign in this area, he would arrange that the claim made by the company for the interest on the money expended on the railway and on the water supply during the period when the Government had control should be paid by the Government?

Sir L. Worthington-Evans said that the claim had received careful consideration, but he was advised that it was inadmissible. In reply to Mr. G. Barker (House of Commons, October 31), Lieut.-Colonel Stanley said the Magadi Soda Co.'s claim could not be submitted to arbitration.

Passing Entries Through Customs.

MR. KILEY (House of Commons, November 1), asked the Chancellor of the Exchequer whether he was aware that on October 28 the officers of H.M.'s Customs informed a firm of collecting and clearing agents that, owing to the enormous amount of work already in hand under the Key Industries Act, they refused to accept any current entries until the accumulation had been disposed of, and would he state what action he proposes to take to deal with this state of affairs.

Mr. Young said the Chancellor of the Exchequer had made special inquiries at the London Custom House, and found that nothing was known there of any such statement as that attributed to them. Such a statement would have been contrary to the facts, as the work there of passing entries for goods liable to duty under Part I. of the Safeguarding of Industries Act was absolutely up to date.

From Week to Week

MR. A. C. MENZIES, B.A., has been appointed an assistant lecturer in physics in the University of Leeds.

THE UNION GLUE AND GELATINE CO., LTD., have removed from 88, Banner Street to Cransley Works, Garrett Street, Golden Lane, E.C.1.

The large factory, erected at Kelham by Home Grown Sugar, Ltd., which is now practically completed, was formally opened on Wednesday by Sir Arthur Griffith-Boscawen.

At a meeting of the directors of Nobel Industries, Ltd., held on October 27, the board appointed COLONEL G. E. STANLEY SMITH, D.S.O., as a director in place of the late Sir George Smith.

At a general meeting of the RUBBER TRADE ASSOCIATION, held in Mincing Lane Commercial Sale Rooms, on October 31, the rules and contracts for the new fortnightly rubber settlement were passed unanimously.

In reply to Major Barnes (House of Commons, October 25), Sir P. Lloyd-Greame said advances and guarantees amounting to £113,386 4s. 4d. for chemicals and £1,100 for oils and fats had been sanctioned under the exports credits scheme.

It is rumoured, owing to the satisfactory results obtained from the continuous working of the plant of the LOW TEMPERATURE CARBONISATION, LTD., at Barnsley, that important financial developments are likely in the near future.

Speaking at the annual meeting of Sadler & Co., Ltd., chemical manufacturers, held at Middlesbrough, on October 26, Mr. A. E. SADLER said the clubhouse which had been provided for the staff had done a great deal to promote confidence between employers and employed.

A meeting of the Manchester Branch of the National Union of Scientific Workers, held on October 28, was addressed by Professor L. Bairstow, F.R.S., the President. Other speakers included Professors J. Proudman and J. Johnstone, and Mr. A. J. Church, the General Secretary.

The general discussion held in Sheffield in November, 1920, by the Faraday Society on "ELECTRODEPOSITION AND ELECTROPLATING" has now been reprinted and published in limp cloth covers at 10s. 6d. Copies may be obtained on application to the Secretary of the Faraday Society.

At the third annual general meeting of the INDUSTRIAL WELFARE SOCIETY, held in the Society's offices at 51, Palace Street, S.W. 1, on Thursday, Lord Invernairn expressed the hope that a large meeting of employers would be held in the near future to consider the possibilities of the welfare movement in industry.

The Secretary for Mines has appointed Mr. W. W. Carson and Mr. H. Nixon to be ADDITIONAL MEMBERS of the Advisory Committee for the Metalliferous Mining Industry. Mr. Carson will represent the owners of iron ore mines and quarries and Mr. Nixon represents the workers in or about iron ore mines and quarries.

A "Dictionary of Applied Physics," an important work which Messrs. Macmillan have arranged to publish under the editorship of Sir Richard Glazebrook, is now in an advanced stage of preparation. The work, which is fully illustrated, will appear in five large octavo volumes, containing some 600 to 700 pages each.

The next meeting of the Society of Glass Technology will be held in the Fuel Department of Leeds University on November 16, at 2.30 p.m., when Mr. F. W. Knowles will give a demonstration of AN IMPROVED GAS REVERSING VALVE for regenerative furnaces. The demonstration will be followed by a general discussion on "The Melting of Glass."

The next meeting of the London Section of the Society of Chemical Industry will be held in the rooms of the Chemical Society, Burlington House, Piccadilly, W., on November 7, at 8 p.m., when a paper entitled "Comparison between Laboratory Fuel Tests and Practical Working Results of the Producer Gas Process," by Mr. N. E. Rambush, will be read.

A NEW RATE OF WAGES for the workers in the calico printing, bleaching, and dyeing industries of Lancashire, Cheshire, and Derbyshire comes into force this week. The new rates involve a drop of 2s. 9d. per week for adult male workers; 2s. 2d. a week for male workers eighteen to twenty-one years of age; 1s. 7d. a week for females eighteen and over, and males sixteen and under eighteen; 1s. 3d. a week for females sixteen and under eighteen; 1s. 2d. a week for males under sixteen, and 1s. a week for females under sixteen.

The Public Health Department of the Salford Corporation draws attention, in a public notice, to the danger likely to arise from the use of commercial borax in preservatives through the presence of arsenic, and recommends that where borax is used in preservatives a guarantee should be obtained that such preservatives conform to the requirements of the Food and Drugs Act.

The Administrative Committee of the National Union of Manufacturers have passed a resolution expressing to the Board of Trade its SATISFACTION AT THE EFFECTIVE OPERATION of Part I. of the Safeguarding of Industries Act, and urging the Board to hasten into operation Part II. of the Act, in order to safeguard employment in British industries against the effects of the depreciation of foreign currencies.

Among the successful candidates at the NOVEMBER MUNICIPAL ELECTIONS are: BURTON-ON-TRENT: Mr. W. G. Hutchinson, of Hutchinson & Co., chemical manufacturers; BARNSLEY: Mr. W. F. J. Wood, glass bottle manufacturer; ST. HELENS: Mr. R. A. Pilkington, glass manufacturer; SOUTH SHIELDS: Mr. J. Walker, chemist; LEEDS: Mr. P. Marsden, dyer, and Mr. F. L. Lunn, dyer.

Following on the voluntary liquidation of SHARP & MALLETT, LTD., chemical manufacturers, Halifax, the firm's works, covering an area of about 9 acres, were, on October 28, offered for sale by auction. As the bids, which finished at £14,750, did not reach a suitable figure, the offer was withdrawn, and the auctioneer intimated that if the works were not sold as a whole within a few days the plant would be sold separately.

In a paper on "Petroleum and its Importance to the Empire," contributed to the first number of the technical magazine of the Mining Society of the University of Birmingham, Sir John Cadman states that only an infinitesimal part of the oil-bearing rocks of the world have yet been thoroughly examined for petroleum products, but if only a moiety of them are found to contain petroleum the world will have a plentiful supply.

On Wednesday morning an explosion occurred at the works of the British Dyestuffs Corporation at Crumpsall, Manchester, in a shed in which oil of mirbane was being distilled. The building has a glass roof, and the five men, including a junior chemical engineer, working there, were slightly hurt, chiefly by the falling glass. The cause of the explosion was an outbreak of fire in some way not ascertained, the heat of which vaporized and then fired the inflammable chemicals in the building. The damage to the roof is not serious, though the explosion was heard over a wide area of North Manchester.

At a meeting on Thursday of the Royal Society the following were among the papers to be read: "On the Spectra of Lead Isotopes," by Professor T. R. Merton, F.R.S.; "Experiments with Rotating Fluids," by G. I. Taylor, F.R.S.; "The Two-dimensional Slow Motion of Viscous Fluids," by Professor L. Bairstow, F.R.S., Miss B. M. Cave and Miss E. D. Lang; "The Production of Single Crystals of Aluminium and their Tensile Properties," by Professor H. C. Carpenter, F.R.S., and Constance Elam; "On the Transmission Colours of Sulphur Suspensions" (communicated by Dr. G. C. Simpson, F.R.S.), by Professor C. V. Raman and B. Ray; and "The Law of Distribution of Particles in Colloidal Solution" (communicated by Professor J. C. McLennan, F.R.S.), by Professor E. F. Burton and Miss E. Bishop.

Replying last week to a deputation from the British Chemical Trade Association on the subject of the Key Industries list, Mr. PERCY ASHLEY, of the Board of Trade, stated that in compiling the list of articles subject to Part I. of the Key Industries Act, the Board of Trade was given no discretion. The list had to be made in accordance with the schedule of the Act, whether certain products were or were not manufactured in the United Kingdom. The Department had acted in an administrative capacity, and had no power to revise or amend the list. The appointment of a referee to hear disputes was provided for under the Act. They considered it to be probable that protests would be heard by the referee with regard to certain products which were included in the list coming within the scope of the schedule, but which, being unobtainable from manufacturers in this country, should be removed from the list.

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British Industries Fair, 1922

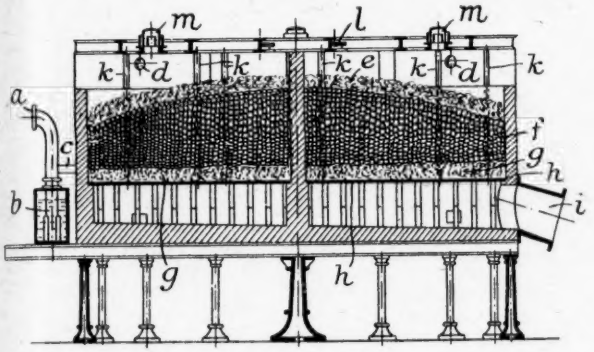
THE Board of Trade announces that the next British Industries Fair, which is organised by the Department of Overseas Trade, will be held from Feb. 27 to March 10, 1922. Following the precedent of previous years, this great display of British products will not be confined to one locality, but will be divided between the White City, London, and the Castle Bromwich Aerodrome, Birmingham. Additional accommodation has been secured in both cities to meet exhibitors' demands for space.

Patent Literature

Abstracts of Complete Specifications

169,467. Extraction of Sulphur from Gases containing Sulphuretted Hydrogen, Process and Apparatus for. Chemische Fabrik Rhenania, Wilhemstrasse 51, Aix-la-Chapelle, Germany, and F. Projahn, Stolberg 2, Rhineland, Germany. Application date, March 6, 1920.

This process is an improvement on the Claus process for obtaining sulphur from gases containing sulphuretted hydrogen by passing the gas, mixed with air, through a layer of a contact substance such as bog iron ore. The reaction of sulphuretted hydrogen and oxygen under these circumstances produces a mixture of steam and sulphur, but only about 80-85 per cent. of the sulphur is recovered in this manner. The remainder re-acts with the steam, producing a mixture of sulphuretted hydrogen and sulphur dioxide which escapes. It is now found that this second undesirable reaction may be avoided if the contact layer is supplemented by an additional contact layer which is maintained at a lower temperature. The passage of the gas is so regulated as to maintain a temperature



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in the first contact zone of about 330°C., and in the second zone of at least 200°C. at the outlet side. The contact material is preferably bauxite. The process is applicable to gases containing more than 15 per cent. of sulphuretted hydrogen and the gas, mixed with air, is passed through a pipe *a*, hydraulic seal *b*, and distributing piping *c*, to a number of nozzles *d*, in the upper part of the furnace. The mixed gases flow downwards through the contact layer *e* in which the first reaction indicated above occurs, and then through the lower contact zone *f* where the sulphuretted hydrogen and sulphur dioxide re-act and liberate sulphur. The sulphur and waste gases are drawn off by the pipe *i*. The layer *e* is preferably about 30 cm. thick, and the layer *f* about 2 metres thick. With this apparatus a yield of sulphur up to 97 per cent. may be obtained. The apparatus is worked simultaneously with a small test furnace which works more quickly, and the gases from the latter are tested so that the proportions of gas admitted to the main furnace may be regulated.

169,498. Alkaline Condensing Agents, Manufacture of. E. Bergve, Notodden, Norway. Application date, June 22, 1920.

The process is for producing an alkaline condensing agent having a low melting point for use in organic syntheses such as the manufacture of indigo dye. In such operations the temperature of the condensing agent should be as low as possible, and it is found that this temperature may be diminished if instead of using a mixture of potassium hydroxide and sodium or sodium amide, a mixture containing metallic sodium or potassium in solution in alkali metal hydroxide is used. A condensing alkaline melt of this kind is obtained by electrolysing an equi-molecular mixture of fused potassium and sodium hydroxides so that the separated metals immediately enter into solution yielding a homogeneous substance. This may be done by using an E.M.F. of about 3 volts and a cathode current density of about 0.01 amps. per square centimetre, and an anode current density up to 50 amps. per square centimetre. Reference is directed in pursuance of section 7, sub-section 4 of the Patents and Designs Acts, 1907 and 1919, to Specification No. 24, 571/1910.

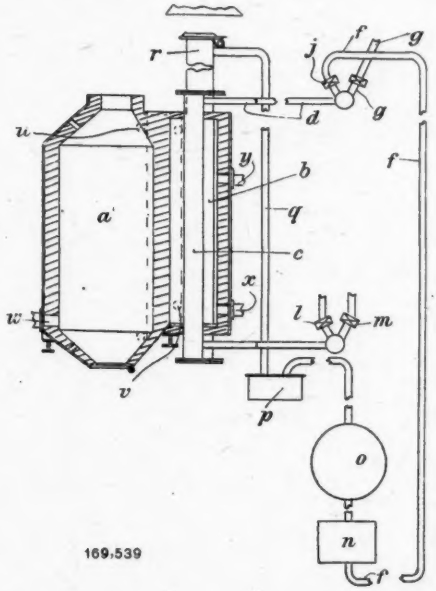
F

168,605. Diffusing Gases and Vapours through Liquids, Mechanism for. A. E. O'dell, London. (From the American and Canadian Finance and Trading Co., Ltd., 511, Union Bank Building, Victoria, B.C., Canada.) Application date, August 23, 1920.

The apparatus is for effecting intimate contact between gases and liquids and is applicable to the treatment of gases and vapours from petroleum stills, coke ovens, and gas producers, with liquids such as water, petroleum, tar or acid. The gas and vapour to be treated are compressed and passed into the lowest compartment of the apparatus from which they pass upwards through a porous diaphragm which supports the washing liquid. The diaphragm is preferably of earthenware, and is of such a character that the gas is enabled to pass upwards through it in a state of very fine division into the liquid, but the latter is not capable of passing downwards through the diaphragm. A number of such compartments are arranged one above the other for successive treatment of the gas, and are provided with external pipes connecting the compartments so that the liquid may pass from one to the other independently of the diaphragms. The apparatus is particularly suitable for fractional separation of the constituents of petroleum and tar.

169,539. Hydrogen, Combined Heating and Generating Plant Adapted to the Manufacture of. R. & J. Dempster, Ltd., H. S. Knight and F. J. Siddall, Gas Plant Works, Oldham Road, Manchester. Application date, July 3, 1920.

Producer gas is generated from hot coke in a generator *a* by blowing in air through the inlet *w* and the gas passes through an outlet *u* and pipe *v* to the bottom of a chamber *b* where it is utilised to heat the retorts *c*. Primary and secondary air for combustion are admitted through the inlets *x* and *y*. Additional heat may be obtained by generating some water gas in the retort *a* by admitting steam. The retorts *c* contain the iron ore for the manufacture of hydrogen. When the ore is to be deoxidised, steam is admitted to the generator *a* to



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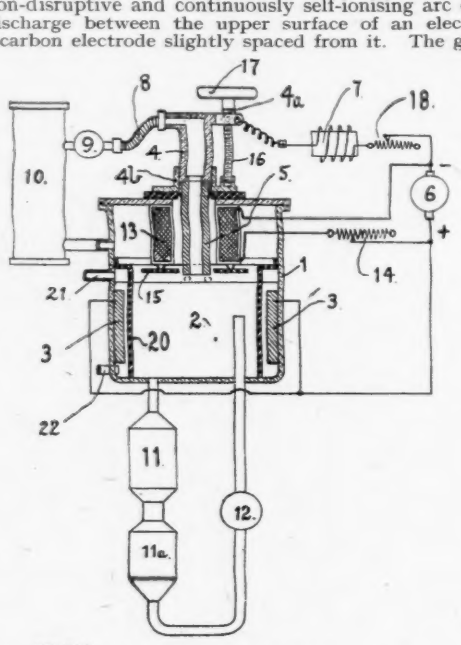
produce water gas which is passed into the chamber *b* without combustion, and thence through the pipes *r* and *q* to a washer seal *p* and gas-holder *o*. The gas then passes through a purifier *n*, pipe *f*, valve *j*, and pipe *d* to the retorts *c*. The spent gases pass from the retorts through the pipes *e* and *h*. The valves *l* and *m* are then adjusted so that steam passes through the pipes *i*, *e* into the retorts *c* and the hydrogen produced therein is drawn off through the pipes *d* and *g*.

169,513. SULPHUR-TERPENE COMPOUND. W. B. Pratt, Wellesley, Norfolk, Mass., U.S.A. Application date, June 25, 1920.

Equal parts of oil of turpentine and sulphur are heated in a vessel provided with a reflux condenser. A reaction takes place at 150°C. and the temperature is then raised to 175°C. during 1 hour and then to 200°C. during the next 2 hours. A progressive reaction occurs during which sulphur partly combines with the turpentine and is partly converted into sulphuretted hydrogen. A neutral, hard, and brittle substance is obtained which is insoluble in water, partly soluble in acetone, and soluble in turpentine, toluol, and xylol. This substance, either alone or in solution, is suitable for impregnating or coating absorbent materials; it is also capable of reacting with and vulcanising on to rubber and rubber compounds. The properties of the product may be varied by controlling the amount of sulphuretted hydrogen evolved, a viscous, non-colloidal substance being obtained if the reaction is stopped at an earlier point.

169,548. ELECTRICAL SYSTEMS AND APPARATUS FOR INDUCING CHEMICAL ACTION. W. J. Rickets, 4, Aylward Road, Forest Hill, London, S.E. 23. Application date, July 8, 1920.

The object is to induce chemical action by the production of a non-disruptive and continuously self-ionising arc or arc-like discharge between the upper surface of an electrolyte and a carbon electrode slightly spaced from it. The gaseous



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atmosphere surrounding the arc may be introduced or may be composed of the products obtained from the electrolyte. The difference of potential used is not high compared with that used in high tension apparatus for promoting gaseous reactions. The current is obtained from a unidirectional source and a considerable inductance is included in the circuit. As an example, the pressure may be 300 volts and the coefficient of self-induction of the inductance may be more than 1 henry. Under these circumstances the carbon electrode is maintained at a high temperature and a considerable direct current passes through the arc. The temperature at the other electrode, *i.e.*, the surface of the electrolyte, is limited by the boiling point of the latter. The apparatus is particularly suitable for the production of endothermic reactions, since the products of such reactions are rapidly moved into a zone of lower temperature. In one example acetylene may be formed by using a carbon electrode in a hydrogen atmosphere and the gas may be immediately absorbed in a solution of a copper salt forming the electrolyte thus forming cuprous acetylide. In another example, cyanogen may be formed in an atmosphere of nitrogen and may be absorbed in an electrolyte of sodium sulphate or mercuric chloride. In other cases the reaction may involve ions discharged from the electrolyte. A vessel 1 is provided with carbon plates 3, and contains an electrolyte 2. A tubular carbon electrode 5 passes through an insulated gland 4b and is connected to the negative pole of a dynamo 6 through an inductance 7 and resistance 8. The other pole of the dynamo is connected to the plates 3. Gases which are to take part in the reaction are passed downward through the hollow electrode 5 and may then be drawn through an absorbing tower 10 by a pump 9. The electrolyte may be circulated through a cooler 11, filter 11a and pump 12 to withdraw any desired products. Any products produced around the anodes 3 are retained by the partitions 20. A solenoid 13 is provided to cause a rotation of the arc and equalise the disintegration of the tube 5.

169,536. ALKYL AMINES, MANUFACTURE OF. British Cellulose and Chemical Manufacturing Co., Ltd., 8, Waterloo Place, London, S.W. 1, W. Bader, and D. A. Nightingale, of British Cellulose and Chemical Manufacturing Co., Ltd., Spondon, near Derby. Application date, July 2, 1920.

The known process for obtaining monomethylamine by the reaction of sodium hypochlorite and caustic soda on acetamide is unsatisfactory in practice owing to the violence of the reaction when large quantities are used. Further, the methylamine obtained requires purification from ammonia and dimethylamine. If the sodium hypochlorite and caustic soda are replaced by calcium hypochlorite and milk of lime, a chemically pure product is obtained, but the yield is only 20 per cent. It is now found that a high yield (over 80 per cent.) of pure monomethylamine may be obtained by mixing acetamide with milk of lime and calcium hypochlorite (bleaching powder) or other hypochlorite except alkali hypochlorite, at a temperature of about 5°C. Sodium carbonate is then added gradually while keeping the temperature low, and the mixture is finally distilled and the methylamine condensed or absorbed. The sodium carbonate may be replaced by the borate or phosphate, or other alkali carbonate, borate or phosphate which is capable of forming caustic alkali by reaction with lime. The high yield is attributed to the absence of a strong alkali in the early stages in the presence of acetamide, the alkalinity being insufficient to hydrolise the acetamide. Other amides such as propionamide may be similarly treated to obtain the corresponding monoalkylamines.

169,580. LOW TEMPERATURE CARBONISATION AND GASIFICATION OF COAL AND OTHER CARBONACEOUS MATERIAL. C. W. Tozer, 66, Victoria Street, Westminster, London. Application date, July 30, 1920.

The carbonisation process is carried out at a temperature between 400° and 600°C. and a vacuum of 70-150 mm. mercury gauge in the retorts, and no binder is used with the material. The gas is drawn off and passed through an atmospheric or water-cooled condenser to precipitate tar vapour, and suspended liquid particles are then removed by passing through a frictional apparatus. The gas is then passed through the vacuum pump, so that the condenser and frictional apparatus are operated under a vacuum. The gases are then compressed to about 3 to 4 atmospheres pressure, and then suddenly released whereby a portion of the light gaseous hydrocarbons is separated as a liquid similar to petrol. The gases are then passed through an ammonia scrubber at a moderate pressure and a low temperature, and are then passed through an oil washer which extracts the remainder of the light hydrocarbons. The oil may then be distilled to obtain the absorbed hydrocarbons as motor spirit.

169,667. α-AMINO-ANTHRAQUINONE, MANUFACTURE OF. O. Imray, London. (From Society of Chemical Industry in Basle, Switzerland.) Application date, April 20, 1921.

It is known that anthraquinone sulphonic acids may be converted into amino anthraquinones by treatment with ammonia and an oxidising agent such as manganese dioxide, a bichromate, or a copper compound. This process, however, involves a subsequent extraction process to obtain the α-amino anthraquinone. The amino compound may be obtained in a pure form by using arsenic acid as the oxidising agent, but a good yield is only obtained in the case of *b*-amino anthraquinone. It is now found that α-amino anthraquinone may be obtained by heating in an autoclave to 160°-165°C., potassium α-anthraquinone sulphonate 165 parts, ammonia solution (24 per cent. strength) 500 parts, and sodium nitrobenzene sulphonate 60 parts. The mixture is then filtered and crystalline α-amino-anthraquinone is obtained in a yield of about 80 per cent. Other aromatic nitro sulphonates may be used in place of the benzene compound. The filtrate may be treated for the recovery of aniline sulphonic acid.

NOTE.—Abstracts of the following specifications which are now accepted appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention: 146,231 (United Filters Corporation) relating to rotary suction filters, *see* Vol. III., p. 321; 146,234 (E. Kolshorn) relating to manufacture of salts of compounds of lactic acid and tannic or gallic acids, *see*, Vol. III., p. 321; 147,196 (Dorr Co.) relating to selective recovery of organic materials from liquids, *see* Vol. III., p. 405; 147,711 (Verein Chemischer Fabriken) relating to manufacture of hydrofluoric acid from natural fluorides, *see* Vol. III., p. 430; 153,889 (Fuller Lehigh Co.) relating to pulveriser mills, *see* Vol. IV., p. 133.

International Specifications not yet Accepted

168,573. CRACKING HYDROCARBONS. V. L. Emerson, 6381, Overbrook Avenue, Philadelphia, Pa., U.S.A. International Convention date, May 6, 1920.

Oil is cracked in a still 1 which is provided with circulating devices, and the vapour passes by a pipe 2 to a chamber 3, where it is divided into opposing jets which are brought into violent impact. Alternatively the jets may be directed against a baffle plate, and a pipe 11 may be connected to the vessel 8 so that liquid oil is also drawn in and subjected to impact. Oil to be treated is fed into the vessel 8, and is subjected to treatment by the vapour delivered through the pipe 7. Vapour from the vessel 8 passes in succession through condensers 16, 17, 18, and cold water is passed through the condensers in the opposite direction, becoming steam in the condensers 17 and 16. A series of bubbling trays 30, 31, 32, are arranged between the vessel 8 and the condenser 16, and trays 39, 40, are arranged between the condensers 16 and 17. Means are provided for withdrawing the condensate at each of these points. The residual vapour finally passes to a water seal 53 and thence to a condenser 58.

168,576. CHLORINATED HYDROCARBONS. Glysyn Corporation, 149, Broadway, New York. (Assignees of H. F. Saunders, Bound Brook, N.J., U.S.A., and L. T. Sutherland, Malba, New York.) International Convention date, August 31, 1920.

A compound obtained by saturating an unsaturated hydrocarbon with chlorine, *e.g.*, propylene chloride, is again subjected to the action of chlorine mixed with not more than 1 per cent. of a sulphur compound such as sulphur dioxide, sulphur chlorides, or sulphuryl chloride. The process is carried out in sunlight or ultra-violet light, or other actinic light, and at atmospheric or higher temperatures. The product, which is trichlorhydrin, is separated from unchanged propylene chloride by distillation.

168,581. GAS MANUFACTURE. Trent Process Corporation, 1440, U Street, Washington, D.C., U.S.A. (Assignees of W. E. Trent, 908, G Street, Washington, D.C., U.S.A.) International Convention date, August 31, 1920.

Coal is finely ground to pass through a screen of 200 mesh and is mixed into a suspension with water. The mixture is pumped through a coiled pipe heated to about 1,000°C., where it is converted into water gas, and the gas then passes through a scrubber. Lignite, lamp-black or coke may be used in place of coal, and oil may also be added, in which case carburetted water gas is obtained. Alternatively, gas may be obtained from a mixture of the carbonaceous material and oil, or from a mixture of oil and water.

LATEST NOTIFICATIONS

170,562. Process for the manufacture of substances of the fatty-acid type from resins. Melamid, M. October 20, 1920.

170,565. Apparatus for atomising liquids. Garda, E. October 21, 1920.

170,571. Production of electrolytic iron. Soc. Anon. de Fer. October 19, 1920.

170,572. Purification of gases. Koppers Co. October 22, 1920.

170,575. Process and apparatus for purifying gases by electricity. Siemens-Schutkertwerke Ges. October 22, 1920.

170,591. Removal of tar from the vapours arising from the distillation of wood. Barbet et Fils et Cie, E. October 21, 1920.

Specifications Accepted, with Date of Application

144,614. Chemical reactions, Process of and apparatus for controlling the temperature of. Barrett Co. June 11, 1919.

145,610. Cellulose, Process for the treatment of—and products manufactured therefrom. F. Moeller. June 29, 1920.

146,974-5. Lubricating oils from bituminous materials, Process for manufacturing. Deutsche Erdöl Akt.-Ges. F. Seidenschnur and C. Koettnitz. Nov. 6, and March 3, 1916.

147,184. Waste liquors containing soapy or soap-making organic matter, Treatment of. Dorr Co. July 1, 1919.

147,415. Sugar and similar products from wood and other cellulose-containing materials, Process for obtaining. Zellstofffabrif Wäldhof and V. Hottenroth. April 18, 1917.

147,474-6-147,488. Naphthalene, Hydrogenation of. G. Schroeter. February 24, and December 7, 1915, and May 13, 1916. 147,476 and 147,488 additions to 147,474.

147,578. Hydrogenation, Process for—and the production of catalysts. E. Sittig and A. Granichstädten. July 7, 1917.

147,580-747. Naphthalene, Hydrogenation of. Tetralin Ges. August 1, 1916. 147,747 addition to 147,580.

147,704. Vat dyestuffs, Manufacture of. R. B. Ransford. (L. Cassella & Co.) July 8, 1920.

147,742. Washing or otherwise treating liquids with liquids or vapours, Apparatus for. B. de M. Vivies. March 26, 1919.

148,111. Metallic non-pyrophoric catalysts, Production of. C. & G. Muller, Speisefettfabrik Akt.-Ges. February 6, 1919.

148,436. Coal, Manufacture of liquid organic compounds from. F. Bergius. August 22, 1916.

148,799. Filters used in dry-gas purifying plants, Process for removing dust from. W. E. Evans. (Deutsche Maschinenfabrik Akt.-Ges.) July 10, 1920.

148,811. Liquids from gases or vapours, Separation of. E. A. Raymond. December 24, 1918. Addition to 130,992.

149,317. Tar oils, Producing viscous liquids from. L. Lilienfeld. August 1, 1919.

149,319. Compositions containing ethers of carbohydrates having the empirical formula $n(C_6H_{10}O_5)$, their conversion products and derivatives. L. Lilienfeld. Aug. 1, 1919.

150,708. Alkylene Cyanhydrins. Chemische Fabrik Röhm & Haas. September 3, 1919.

169,460. Dyestuffs of the acridine series, Manufacture of. Akt.-Ges. für Anilin Fabrikation. April 22, 1915.

170,020. Vaporisation and gasification of liquids. E. Cleary. April 1, 1920.

170,022. Catalytic oxidation processes. J. M. Selden and Selden Co. April 7, 1920.

170,026. Furnace for melting zinc powder into liquid zinc. C. E. Cornelius. April 13, 1920.

170,056. Chlorinated derivatives of Toluene. British Dyestuffs Corporation, Ltd., A. G. Green and A. E. Herbert. June 15, 1920.

170,082. Zinc oxide suitable for metallurgical treatment, Production of—from gypseous precipitates. A. Mond. (Metallbank und Metallurgische Ges.) July 9, 1920.

170,093. Oils and other hydrocarbons, Purification of. M. Benson. July 10, 1920.

170,100. Smelting of ores, roaster residues, slags, etc., containing iron and zinc. L. H. Diehl. July 12, 1920.

170,140. Distillation of hydrocarbon oils, asphalts and the like. E. F. Engelke. July 27, 1920.

170,152. Desulphurizing gases, Process for. J. Y. Johnson. (Badische Anilin & Soda Fabrik.) August 4, 1920.

170,155. Soluble chromium lakes of azodyes. W. Carpmael. (Farbenfabriken vorm, F. Bayer & Co.) August 11, 1920.

170,185. Alkali Formates. G. C. Bacon. (Oldbury Electro Chemical Co.) September 17, 1920.

170,197. Vertical retorts for destructive distillation of carbonaceous materials. S. Glover, J. West, and West's Gas Improvement Co., Ltd. October 16, 1920.

Applications for Patents

Ballantine, W. B. Manufacture of ferro-chromium alloys. 28,348. October 25.

Burgess, Ledward, & Co., Ltd., and Harrison, W. Means for dyeing cellulose acetates. 28,490. October 27.

Burgess, Ledward, & Co., Ltd., and Harrison, W. Production of cellulose derivatives. 28,731. October 29.

Cumberland Coal Power & Chemicals, Ltd., and Jaques, A. Manufacture of ammonium sulphate. 28,557. October 27.

Dangerfield, A. Apparatus for treating materials with gases for drying, cooling, &c. 28,584. October 27.

Dutt, E. E., and Godfrey, S. H. Preparation of white pigment bases from titaniferous bauxites. 28,525. October 27.

Gunn, M. J. Process for rendering gelatine, &c., insoluble. 28,180. October 24.

Jones, B. D., and Kelly, A. Process for production of sodium pentaborate from boron ores. 28,293. October 25.

Moseley, J. F. Catalytic and absorptive colloidal products and their preparation. 28,709. October 29.

Plauson's (Parent Co.), Ltd., and Plauson, H. Process for manufacture of dispersoids. 28,636. October 28.

Richter, J. Process for manufacture of a composite material from cellulose and cotton, &c. 28,434. October 26.

Smythe, R. H. Process to accelerate gravitation of mineral particles suspended in fluid for recovery of tin oxide, &c. 28,137. October 24.

Society of Chemical Industry in Basle and Imray, O. Y. Manufacture of dye-stuffs of the triarylmethane series. 28,325. October 25.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

Market Report.

THURSDAY, November 27.

There has been a steady demand for chemicals during the past week, although transactions are generally on the small side. On the whole, the tendency remains upwards. There is a most noticeable diminution in the virulence of continental competition, particularly from Germany.

The export demand is only fair, although several good lines have been booked.

General Chemicals

ACETONE is in active demand, and stocks are very small.

ACID ACETIC has again experienced a substantial advance. A rather acute shortage is developing for both spot and forward positions.

ACID CITRIC is unchanged.

ACID FORMIC is a steady market, the tendency being in sellers' favour.

ACID OXALIC is very quiet, but it would appear that higher prices are inevitable, following the clearing of certain stocks.

ACID TARTARIC is quiet and uninteresting.

BICHROMATES.—The reduction in price which we indicated last week does not appear to have substantially increased the demand.

BLEACHING POWDER has been in inquiry for export, but little business seems to have been placed on this side.

COPPER SULPHATE remains featureless.

FORMALDEHYDE is much firmer, and an advance in price is expected.

IRON SULPHATE remains a nominal market.

LEAD ACETATE is not inquired for, and stocks are hanging fire.

LEAD NITRATE is uninteresting.

LITHOPONE is in very poor demand, but it is thought that the result of better inquiry will soon be reflected in the price.

POTASSIUM CARBONATE and CAUSTIC are both in buyers' favour; the market remains over-stocked.

POTASSIUM CHLORATE is a dead letter, although some low continental offers have been withdrawn.

POTASSIUM PRUSSIATE is in very short supply, and foreign quotations have hardened substantially.

SODIUM ACETATE is in fair demand, and is inclined to advance in price in sympathy with Acetic Acid.

SODIUM CAUSTIC has been in active demand for export, and a distinct shortage is apparent.

SODIUM NITRITE is quiet, and only hand-to-mouth orders are visible.

SODIUM PHOSPHATE is perhaps in slightly better demand, and in some quarters it is thought that the makers have turned the corner.

SODIUM PRUSSIATE is very firm indeed, and stocks are keenly competed for.

Coal Tar Intermediates

Business during the past week has shown a rather better tone, more enquiry being received. This slightly better tendency is evident both in the Home and in the Export markets, and it seems as if consumers were nearing the end of stocks and coming more into the open.

ALPHA NAPHTHYLAMINE continues in quiet demand at recent values.

ANILINE OIL AND SALT.—Some inquiries have been received, and business is passing at about recent figures; resale parcels seem to be pretty well absorbed.

BENZIDINE BASE has been inquired for, and a fair business has been done. The price is firm.

BETA NAPHTHOL continues in quiet demand at recent values.

DIMETHYLANILINE has been enquired for, both for Home and for Export account, and is not available in large quantities.

DIPHENYLAMINE continues in demand and has a fair market.

"H" ACID is without change.

PARANITRANILINE is lifeless.

RESORCIN has been inquired for.

SALICYLIC ACID continues in firm demand at recent figures.

Coal Tar Products

The market is still very quiet generally.

90's BENZOL is still very quiet at 2s. 7d. to 2s. 8d. in the Midlands and 2s. 10d. to 3s. in the South, although there are signs of slight weakening in the market.

PURE BENZOL is very quiet, at 3s. 6d. per gallon on rails.

CREOSOTE OIL is weaker, and business has been done at 7d. in the North and 8d. in the South.

CRESYLIC ACID remains quiet, and is quoted at 2s. 1d. to 2s. 2d. on rails for the Pale quality, while Dark is quoted at 1s. 9d. to 1s. 11d.

SOLVENT NAPHTHA is rather weaker, and is worth about 2s. 8d. on rails in the Midlands and 2s. 11d. to 3s. in London.

NAPHTHALENE is quoted from £5 to £8 per ton f.o.r. for Crude according to quality, while Refined is worth from £14 to £18 per ton.

PITCH.—The market is quiet, with very little demand.

Sulphate of Ammonia

The demand is steady, and prices are unchanged.

Current Prices

Chemicals

	per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	2	1	to	0	2	2
Acetone oil	ton	87	10	0	to	90	0	0
Acetone, pure	ton	90	0	0	to	95	0	0
Acid, Acetic, glacial, 99-100%	ton	60	10	0	to	62	10	0
Acetic, 80% pure	ton	45	0	0	to	48	0	0
Arsenic	ton	95	0	0	to	100	0	0
Boric, cryst	ton	65	0	0	to	68	0	0
Carbolic, cryst. 39-40%	lb.	0	0	6½	to	0	0	7
Citric	lb.	0	2	5	to	0	2	6
Formic, 80%	ton	65	0	0	to	67	10	0
Gallic, pure	lb.	0	3	0	to	0	4	0
Hydrofluoric	lb.	0	0	8½	to	0	0	9
Lactic, 50 vol	ton	38	0	0	to	40	0	0
Lactic, 60 vol	ton	40	0	0	to	43	0	0
Nitric, 80 Tw	ton	38	0	0	to	40	0	0
Oxalic	lb.	0	0	8½	to	0	0	9
Phosphoric, 1.5	ton	45	0	0	to	47	0	0
Pyrogallic, cryst	lb.	0	7	3	to	0	7	6
Salicylic, Technical	lb.	0	1	2	to	0	1	3
Salicylic, B.P	lb.	0	1	6	to	0	1	8
Sulphuric, 92-93%	ton	8	0	0	to	8	10	0
Tannic, commercial	lb.	0	3	6	to	0	3	9
Tartaric	lb.	0	1	5	to	0	1	6
Alum, lump	ton	18	0	0	to	18	10	0
Alum, chrome	ton	37	10	0	to	40	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	12	0	0	to	13	0	0
Aluminium, sulphate, 17-18%	ton	15	0	0	to	16	0	0
Ammonia, anhydrous	lb.	0	1	10	to	0	2	0
Ammonia, .880	ton	35	0	0	to	37	0	0
Ammonia, .920	ton	22	0	0	to	24	0	0
Ammonia, carbonate	lb.	0	0	4	to		—	
Ammonia, chloride	ton	60	0	0	to	65	0	0
Ammonia, muriate (galvanisers)	ton	45	0	0	to	47	10	0
Ammonia, nitrate	ton	55	0	0	to	60	0	0
Ammonia, phosphate	ton	90	0	0	to	95	0	0
Ammonia, sulphocyanide	lb.	0	3	0	to	0	3	0
Amyl acetate	ton	150	0	0	to	160	0	0
Arsenic, white, powdered	ton	42	0	0	to	44	0	0
Barium, carbonate, 92-94%	ton	12	10	0	to	13	0	0

	Per	£	s.	d.		£	s.	d.
Barium, chlorate	lb.	0	0	11	to	0	1	0
Chloride	ton	15	0	0	to	16	0	0
Nitrate	ton	42	10	0	to	45	0	0
Barium Sulphate, blanc fixe, dry	ton	26	0	0	to	28	0	0
Sulphate, blanc fixe, pulp	ton	16	0	0	to	16	10	0
Sulphocyanide, 95%	lb.	0	1	6	to	0	1	0
Bleaching powder, 35-37%	ton	14	0	0	to		—	
Borax crystals	ton	31	0	0	to	32	0	0
Calcium acetate, Brown	ton	8	0	0	to	9	0	0
,, ,, Grey	ton	10	0	0	to	11	0	0
Calcium Carbide	ton	22	0	0	to	23	0	0
Chloride	ton	8	10	0	to	9	0	0
Carbon bisulphide	ton	60	0	0	to	62	0	0
Casein, technical	ton	85	0	0	to	90	0	0
Cerium oxalate	lb.	0	3	6	to	0	3	9
Chromium acetate	lb.	0	1	1	to	0	1	3
Cobalt acetate	lb.	0	11	0	to	0	11	6
Oxide, black	lb.	0	10	6	to	0	11	0
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	29	10	0	to	30	10	0
Cream Tartar, 98-100%	ton	130	0	0	to	135	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol	ton	88	0	0	to	90	0	0
Formusol (Rongalite)	lb.	0	3	9	to	0	4	0
Glauber salts, commercial	ton	5	5	0	to	5	10	0
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	35	0	0	to	40	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	48	0	0	to	50	0	0
Carbonate (White Lead)	ton	43	0	0	to	46	0	0
Nitrate	ton	48	10	0	to	50	10	0
Litharge	ton	35	10	0	to	36	0	0
Lithopone, 30%	ton	26	0	0	to	28	0	0
Magnesium chloride	ton	12	0	0	to	13	0	0
Carbonate, light	cwt.	2	10	0	to	2	15	0
Sulphate (Epsom salts commercial)	ton	9	10	0	to	10	0	0
Sulphate (Druggists')	ton	15	10	0	to	17	10	0
Manganese, Borate	ton	70	0	0	to	75	0	0
Sulphate	ton	70	0	0	to	75	0	0
Methyl acetone	ton	85	0	0	to	90	0	0
Alcohol, 1% acetone	ton	105	0	0	to	110	0	0
Nickel sulphate, single salt	ton	65	0	0	to	66	0	0
Nickel ammonium sulphate, double salt	ton	67	0	0	to	68	0	0
Potash, Caustic	ton	33	0	0	to	33	10	0
Potassium bichromate	lb.	0	0	7¾	to		—	
Carbonate, 90%	ton	31	0	0	to	33	0	0
Chloride	ton	36	0	0	to	38	0	0
Chlorate	lb.	0	0	5	to	0	0	5½
Meta bisulphite, 50-52%	ton	120	0	0	to	125	0	0
Nitrate, refined	ton	45	0	0	to	47	0	0
Permanganate	lb.	0	1	2	to	0	1	4
Prussiate, red	lb.	0	2	4	to	0	2	6
Prussiate, yellow	lb.	0	1	2½	to	0	1	3
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt.	3	5	0	to		—	
Seconds	cwt.	3	0	0	to		—	
Sodium acetate	ton	28	0	0	to	30	0	0
Arsenate, 45%	ton	45	0	0	to	48	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	6½	to	0	0	7
Bisulphite, 60-62%	ton	25	0	0	to	27	10	0
Chlorate	lb.	0	0	4¾	to	0	0	5
Caustic, 70%	ton	24	0	0	to	24	10	0
Caustic, 76%	ton	25	10	0	to	26	0	0
Hydrosulphite, powder, 85%	lb.	0	2	3	to	0	2	6
Hyposulphite, commercial	ton	15	0	0	to	16	0	0
Nitrite, 96-98%	ton	40	0	0	to	42	0	0
Phosphate, crystal	ton	23	10	0	to	25	10	0
Perborate	lb.	0	1	6	to	0	1	7
Prussiate	lb.	0	0	8½	to	0	0	9
Sulphide, crystals	ton	17	0	0	to	18	0	0
Sulphide, solid, 60-62%	ton	24	10	0	to	25	10	0
Sulphite, cryst	ton	15	0	0	to	16	0	0
Strontium carbonate	ton	80	0	0	to	85	10	0
Strontium Nitrate	ton	70	0	0	to	72	10	0
Strontium Sulphate, white	ton	7	10	0	to	8	10	0
Sulphur chloride	ton	41	0	0	to	42	0	0
Sulphur, Flowers	ton	13	0	0	to	14	0	0
Roll	ton	13	0	0	to	14	0	0
Tartar emetic	lb.	0	1	6	to	0	1	7
Tin perchloride, 33%	lb.	0	1	2	to	0	1	4
Tin perchloride, solid	lb.	0	1	5	to	0	1	7
Protochloride (tin crystals)	lb.	0	1	5	to	0	1	6
Zinc chloride, 102 Tw.	ton	21	0	0	to	22	10	0
Chloride, solid, 96-98%	ton	50	0	0	to	55	0	0
Oxide, 99%	ton	40	0	0	to	42	0	0
Dust, 90%	ton	47	10	0	to	50	0	0
Sulphate	ton	21	10	0	to	22	10	0

Coal Tar Intermediates, &c.

	Per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	3	3	to	0	3	6
Alphanaphthol, refined	lb.	0	3	9	to	0	4	0
Alphanaphthylamine	lb.	0	2	6	to	0	2	8
Aniline oil, drums extra	lb.	0	1	5	to	0	1	6
Aniline salts	lb.	0	1	6	to	0	1	7
Anthracene, 40-50%	unit	0	0	8½	to	0	0	9
Benzaldehyde (free of chlorine)	lb.	0	4	3	to	0	4	6
Benzidine, base	lb.	0	6	0	to	0	6	6
Benzidine, sulphate	lb.	0	6	6	to	0	7	0
Benzoic acid	lb.	0	2	3	to	0	2	6
Benzoate of soda	lb.	0	2	3	to	0	2	6
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	0	5	9	to	0	6	0
Betanaphthol	lb.	0	2	3	to	0	2	6
Betanaphthylamine, technical	lb.	0	9	0	to	0	9	6
Croceine Acid, 100% basis	lb.	0	4	6	to	0	5	0
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	6	9	to	0	7	6
Dinitrobenzol	lb.	0	1	5	to	0	1	6
Dinitrochlorbenzol	lb.	0	1	5	to	0	1	6
Dinitronaphthaline	lb.	0	1	6	to	0	1	8
Dinitrotoluol	lb.	0	1	8	to	0	1	9
Dinitrophenol	lb.	0	2	9	to	0	3	0
Dimethylaniline	lb.	0	3	9	to	0	4	0
Diphenylamine	lb.	0	4	6	to	0	4	9
H-Acid	lb.	0	8	0	to	0	8	6
Metaphenylenediamine	lb.	0	5	6	to	0	5	9
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	6	6	to	0	7	0
Monosulphonic Acid (2.7)	lb.	0	7	0	to	0	7	6
Naphthionic acid, crude	lb.	0	4	0	to	0	4	3
Naphthionate of Soda	lb.	0	4	3	to	0	4	6
Naphthylamin-di-sulphonic-acid	lb.	0	4	9	to	0	5	0
Nitronaphthalene	lb.	0	1	4	to	0	1	5
Nitrotoluol	lb.	0	1	3	to	0	1	4
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	2
Orthotoluidine	lb.	0	2	3	to	0	2	6
Orthonitrotoluol	lb.	0	0	10	to	0	1	0
Para-amidophenol, base	lb.	0	12	0	to	0	12	6
Para-amidophenol, hydrochlor	lb.	0	12	6	to	0	13	0
Paradichlorbenzol	lb.	0	0	7	to	0	0	8
Paranitraniline	lb.	0	4	6	to	0	4	9
Paranitrophenol	lb.	0	2	9	to	0	3	0
Paranitrotoluol	lb.	0	5	9	to	0	6	0
Paraphenylenediamine, distilled	lb.	0	12	0	to	0	13	0
Paratoluidine	lb.	0	7	0	to	0	7	6
Phthalic anhydride	lb.	0	3	9	to	0	4	0
Resorcin, technical	lb.	0	5	0	to	0	5	6
Resorcin, pure	lb.	0	8	0	to	0	8	6
Salol	lb.	0	2	6	to	0	2	9
Sulphanilic acid, crude	lb.	0	1	4	to	0	1	6
Tolidine, base	lb.	0	6	6	to	0	7	0
Tolidine, mixture	lb.	0	2	6	to	0	2	9

French Potash

A fair trade is being carried on with merchants in districts where the popular dressing of slag and French kainit is in request for the autumn and winter manuring. Fertiliser manufacturers, however, are generally disposed to buy cautiously in order to avoid possible losses on their stocks of compound manures to be sold later on. They are coming forward with orders for the less costly grades of potash, such as potash manure salts (Sylvinite 20 and 30 per cent.), but they are not disposed to deal very heavily in muriate or sulphate of potash. Prices are on the whole tending to become firmer, as importers are scarcely in a position to make any considerable revision of quotations at the present time, owing to high freight and port charges and the general overhead charges entailed in importing.

The absence of control and the keen competition prevailing between the French and German potash interests seems to guarantee adequate supplies of all grades of potash fertilisers at very reasonable rates. French supplies are coming forward in very fine condition, and there is every indication that the Alsatian mines will continue largely to supply the potash used in this country.

Possibilities of Peat as a Fuel

LAST week the problem of peat fuel was discussed at a conference of Scandinavian scientists. The general opinion was that it was very uncertain whether peat could furnish a fuel suitable for industrial purposes. The view was also expressed that peat might in time become valuable in much the same way as the inferior metalliferous ores.

Company News

FULLERS' EARTH UNION.—The directors announce a dividend at the rate of 10 per cent. per annum, less tax, on the ordinary shares for the half year, payable on Nov. 16.

A. & F. PEARS.—The accounts for the year to June 30 last, including £13,306 brought in, show an available balance of £108,188. Out of this payment has been made of dividends of 6 per cent. on the preference shares, £12,000; 12 per cent. on the preferred ordinary, £38,400; 20 per cent. on the ordinary, £40,000; £5,000 was placed to reserve; leaving to be carried forward, £12,788.

NIGER CO., LTD.—The directors, regret that, owing to the continued trade depression, they do not feel justified in declaring a dividend on the 8 per cent. Cumulative preference shares at present. It will be recalled that in April last a similar announcement was made.

CENTRAL CHILE COPPER CO.—The report for the year 1920 states that smelting operations, suspended at end of March, 1919, have not been resumed, and the position of affairs remains practically unaltered since the 1919 report was issued. the position of the copper market has not proved favourable to making any arrangements for reopening operations.

SADLER & CO., LTD.—At the annual meeting held at Middlesbrough, on October 26, the directors' report and balance sheet were adopted and a final dividend of 8 per cent., less income tax, making, with the interim dividend of 4 per cent. already paid, 12 per cent. for the year, was declared.

BROKEN HILL SOUTH.—The accounts for the year to June 30 last show that operations resulted in a loss of £56,702, not allowing for depreciation on plant or for debenture redemption. £55,207 was transferred from special reserve for depreciation and £13,333 for debenture redemption. During the year expenses due to stoppages on account of strikes absorbed £49,809.

LAWES' CHEMICAL MANURE CO., LTD.—Dealings in 251,930 ordinary shares of £1 each, fully paid, Nos. 1 to 251,930; and 76,750 preference shares of £1 each, fully paid (7 per cent. non-cumulative and participating), Nos. 1 to 76,750, have been specially allowed by the Stock Exchange Committee under Rule 148A. These securities will rank *pari passu* with those in which special settling days have already been appointed, as soon as they are identical and the certificates are ready for distribution and with those for which an official quotation has already been granted as soon as they are identical and are officially quoted.

ANGLO-BURMA OIL CO., LTD.—The London County, Westminster, and Parr's Bank have been inviting applications for the purchase of 3,000,000 shares of 2s. each at the price of 2s. per share of the Burma Oil Co. Ltd., on behalf of the Associated British Commerce and Industry, Ltd., who have subscribed for the shares at par. Application will be made to the Committee of the Stock Exchange for permission to deal in the shares now offered for sale. The subscription list closed on Thursday.

BORAX CONSOLIDATED, LTD.—An interim dividend of 1s. per share, less tax, is announced on the deferred ordinary shares in respect of the year to September 30 last. The dividend a year ago was the same. Coupon No. 27 will be paid on and after November 18 at the company's offices, 16, Eastcheap, E.C. The transfer books of the deferred ordinary shares will be closed from November 4 to 17 inclusive

Affairs of the Keene Company

THE first meeting of creditors, under a receiving order made against the Keene Co., chemical manufacturers and merchants, 52, Gray's Inn Road, W.C., was held on Tuesday at the London Bankruptcy Court, Mr. F. T. Garton, Official Receiver, presiding. No statement of affairs had yet been lodged. Mr. Alexander Keene said that the liabilities in England amounted to £8,000, of which £2,000 was due to an insurance company and £2,400 to relatives for cash advanced. The assets were, roughly, valued at between £2,000 and £3,000, and included stock (at cost £1,500) estimated to produce £350; book debts £400, and claims for damages £1,300. The business was still being carried on, but the only contract at present outstanding was for the supply of goods to the Indian Government. After some discussion the creditors passed resolutions for bankruptcy and the appointment of Mr. Stanley Parker Booth, certified accountant, of 28, Kimberley House, Holborn Viaduct, as trustee of the estate. A committee of inspection was also nominated.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIALS.	REF. No.
Toronto ..	Drugs; fine and industrial chemicals; gums	363
Zurich ..	Drugs; colonial produce.. ..	372
San Francisco	China clay; heavy chemicals; oxide of iron fertilisers	375
Buenos Aires	Heavy and fine chemicals; india-rubber goods	—
Chile ..	Lubricating oils; calcium carbide	—

Tariff Changes

ST. LUCIA.—The text of a new Customs Duties Ordinance (No. 11 of 1921), and containing revised schedules of import duties and free goods at present in operation in the Colony, may be seen on application to the Tariff Section Department of Overseas Trade, 18, Queen Anne's Gate, S.W. 1.

ARGENTINE REPUBLIC.—The importation into the Argentine of wax matches containing white or yellow phosphorus is prohibited as from January 1, 1922.

FRANCE.—The prohibition on the export and re-export of bauxite is withdrawn as from October 11, and the duty of 20 per cent. *ad valorem* formerly levied on the export on this product is also withdrawn. The export of dephosphorisation slag is again prohibited, and until further notice no export licences will be granted. Consignments which are proved to have been loaded prior to October 17 may, however, be exported with the special authorisation. Volatile oils or essences which have been rectified by distillation in a country enjoying the "Minimum" tariff are subject to the "General" or "Minimum" rates according to the country of origin. They also pay the *surtaxe d'entreport* when the conditions of import and origin so require.

ITALY.—An export licence is no longer required for the exportation from Italy of copper scrap and lead waste.

LATVIA.—The charges for the storage of goods in Latvian Customs warehouses have been revised as from October 1. No charges are made for the first ten days. Particulars of the rates may be obtained from the Tariff Section of the Department of Overseas Trade.

ROUMANIA.—The export tax on bitumen is now 500 lei per wagon. Caustic soda, sulphate of ammonia, and "pertrax" (for boiler cleaning) are exempt from export tax.

BULGARIA.—A proposed new Customs Tariff provides for rates of duty considerably higher than those at present in operation. Particulars of the proposed rates on specified goods may be obtained from the Tariff Section of the Department of Overseas Trade.

German Artificial Silk Company

IT is reported from Berlin that a new company known as the Hoelken G. m.b. H., Co., has been formed for the manufacture of copper oxide ammonia silk. The enterprise is said to be backed by the Farbenfabriken vorm, Friedrich Bayer & Co., and the A. G. für Anilinfabrikation.

Bibliography on Oil Shale

A "Selected Bibliography on Oil Shale," compiled by E. H. Burroughs, bibliographer, and M. J. Gavin, oil shale technologist, has just been issued by the United States Bureau of Mines. The bibliography (Serial 2277) refers to about 300 articles, papers, reports, and treatises bearing on the technology of oil shale, and selected chiefly from the literature of the years 1915-1920. The references cited cover the oil shales of the entire world, and relate to the history of the industry, the geographic occurrence and geology of shale deposits, methods of mining, retorting, refining and utilisation, the properties of shale and their determination, statistics of the industry, legislation and legal regulations and economics. Copies of Serial 2277 may be obtained free on application to the Director of the Bureau of Mines, Washington, D.C.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Partnership Dissolved

ECOB, Charles James, SUGDEN, Fred, and THORPE, John William, as dyers, at the Aspley Dyeworks, St. Andrew's Road, Huddersfield, under the style of The Aspley Dyeing Co., by mutual consent, as from October 20, 1921. Debts received and paid by J. C. Jackson, chartered accountant, 26, Bond Street, Leeds.

Bankruptcy Information

FLEMING, Sidney (trading as Fleming & Co.), of 9, Shortlands Road, Shortlands, Kent, and 47, Mark Lane, London, chemical manufacturer. A bankruptcy notice has been issued at the instance of Harris Bennett, 23, Sackville Street, Piccadilly, moneylender.

BUSH, Emil Frederick, carrying on business at 120, High Road, New Southgate, Middlesex, colour and chemical merchant. Receiving order, October 27, debtor's petition.

Liquidation Notices

M. B. LABORATORIES, LTD. (In voluntary liquidation.) Meeting of creditors at St. Michael's Chambers, 126, High Street, Southampton, on Monday, October 31, at 12 noon. J. Taylor Matthews, liquidator.

Companies Winding Up Voluntarily

TIMMINS DRUG STORES, LTD. W. H. E. Sparks, 60, Scarborough Street, West Hartlepool, corporate accountant, appointed liquidator.

LONDON DRUG AND DENTAL CO., LTD. Frank Goodingham, of 36, Aldboro' Road, Ilford, accountant, appointed liquidator. Meeting of creditors at the office of G. E. Root, 7, New Court, Lincoln's Inn, W.C. 2, on Wednesday, November 16, at 3 p.m. (Notice given to comply with the Companies (Consolidation) Act. The meeting will be purely formal.)

Registration Cancelled Voluntarily

CHEMISTS' FRIENDLY SOCIETY. This society ceases to enjoy the privileges of a registered society from October 25.

County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

BEVAN, M. L. Morriston, druggist. £16 7s. 7d. Sept. 20.

BILLING, Chas., 4, Buckingham Road, Wealdstone, manufacturing chemist. £34 15s. 4d. September 19.

M. B. LABORATORIES, LTD., 19, Borough High Street, Southwark, manufacturing chemists. £39 0s. 10d. September 19.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, created after July 1, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.*]

VITAMINES, LTD., Liverpool, manufacturers and dealers in food of all descriptions, &c.—Registered October 22, £20,000 debentures (filed under section 93 (3) of the Companies (Consolidation) Act, 1908), present issue £18,000; general charge.

JOHNSON & SONS (MANUFACTURING CHEMISTS), LTD, London, E.C.—Registered October 19, £80,000 debentures secured by Trust Deed, dated October 17, 1921; charged on land and premises at Renters Avenue, Hendon, capital redemption policy with Norwich Union Life Insurance to secure £80,000, also general charge. *£69,650. June 14, 1921.

Satisfactions

CARTER (A. H.), LTD., Bristol, general merchants, fertilizer specialists, &c.—Satisfaction registered October 20, £15,000 (not ex.), registered February 2, 1921.

JOHNSON & SONS (MANUFACTURING CHEMISTS), LTD., London, E.C.—Satisfactions registered October 20, £50,000, registered February 26, 1917; £20,000, registered November 26, 1917; £25,000 (not ex.), registered May 14, 1919; and £25,000 (not ex.), registered May 7, 1920.

Receivership

TUDOR (S.) & CO., LTD. W. R. Lockin, of Parliament Chambers, 5, Parliament Street, Hull, ceased to act as receiver and manager on October 17, 1921.

New Companies Registered

The following list has been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C.2:—

ALABONE & CO., LTD., 22 Port Street, Evesham. Chemists and druggists. Nominal capital, £300 in 300 ordinary shares of £1 each. Directors: B. G. G. Alabone, T. R. Collins. Qualification of directors, one share.

BIRMINGHAM CANDLE CO., LTd., Whitehall Road, Great Bridge, Tipton, Stafford. Candle makers, soap makers and perfumers. Nominal capital, £3,000 in 3,000 shares of £1 each. Directors: S. E. Cartwright, P. H. Palmer. Qualification of directors, twenty-five shares.

HALL (L.) & CO., LTD., 8, Back Wood Street, Darwen, Lancaster. Druggists, oil and colourmen, and manufacturers of toilet preparations. Nominal capital, £500 in 500 shares of £1 each. Directors: C. A. Ainsworth, Edna Ainsworth. Qualification of directors, £250.

INGLIS (W. M.), LTD. To carry on the business of chemists and druggists. Nominal capital, £450 in 450 ordinary shares of £1 each. Directors: W. M. Inglis, E. A. Tomblin. Qualification of directors, fifty shares.

INTERNATIONAL OILFIELDS, MINING AND REFINING CO., LTD., 10, Basinghall Street, E.C. 2. Incorporated in Canada. To acquire farms, claims, quarries, mines, mineral and mining rights, petroleum or other oil-bearing lands, and turn same to account. Nominal capital, £3,000,000 in 7,500,000 shares of 8s. each. Name of person authorised to accept service: H. L. Bromhead, 10, Basinghall Street, E.C. 2.

R. I. W. PROTECTIVE PRODUCTS CO., LTD., Manufacturers and dealers in paint, varnish, &c. Nominal capital, £1,000 in 500 preference shares and 500 ordinary shares of £1 each. Directors: A. G. Falkner, C. T. Lewis. Qualification of directors, one share.

Catalogue Received

THE Foster Instrument Co., of Letchworth, Herts, send us an advance copy of their Book No. 26 on Thermo-Couple Pyrometers, in which various types of Foster outfits are described and illustrated. It also contains fourteen pages of theoretical notes which give a brief and concise exposition of the theoretical considerations influencing the use of a successful industrial thermo-couple pyrometer.

United States' Contract for German Potash

ACCORDING to the United States Potash Producers' Association, six large fertiliser manufacturers in that country have signed a contract to obtain 80 per cent. of the potash requirements for the next season from the German potash syndicate. United States producers attribute the necessity for this action to the delay in passing the Tariff Bill, which they contend would have placed them in a position to compete against the low-priced German product.

TRADE GUIDE

CHEMICAL AGE

Acids

SULPHURIC
MURIATIC
DIPPING
BATTERY
NITRIC

OLEUM
(all Strengths)
and
SALTCAKE

SPENCER CHAPMAN & MESSEL, Ltd.
36, Mark Lane, E.C.3.

Acid Resisting Metals

MONEL

Succeeds where other Metals fail.
Acid-resisting-Incorrodible
Bars, Rods, Sheets, Wire
Castings, Forgings.

G. & J. WEIR LTD MONEL DEPT. CATHCART, GLASGOW.

Analytical Reagents

THE BRITISH DRUG HOUSES LIMITED — BDH — LONDON

Research Chemicals
THE BRITISH DRUG HOUSES, LTD.,
Graham St., City Rd.,
LONDON, N.

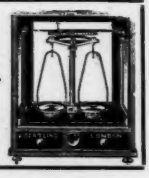
Asbestos

Pioneers of the World's Asbestos Industry

BELL'S UNITED ASBESTOS Co., Ltd.
Southwark Street, LONDON, S.E.1
(Established 1871)

Balances

Oertling
LONDON

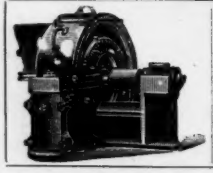


Chemical Plant

BENNETT SONS & SHEARS, Ltd.
43, SHOE LANE,
LONDON, E.C.4.

THE Trade Guide is a compact and handy form of reference to a representative list of firms engaged in various branches of the Industry. In most cases fuller particulars may be found by referring to the displayed advertisement elsewhere.

Chemical Plant (*Continued*)



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SPECIALISE IN
Grinding Machinery for all Materials.
Send for Catalogue.
State Requirements.

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THE decolorising carbon and Refining Agent.
30 Times adsorptive capacity of bone char.
In five grades.
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OXIDES CHROME COBALT
CADMIUM SULPHIDE, SELENIUM, ETC., ETC.
BLYTHE COLOURS
for POTTERY, GLASS, ENAMELLED IRON, AND CEMENT.
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Colours and Oxides (*Continued*)

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Chemical Manufacturers
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PUMICE, CHALK.

Deodorising Compound

KUVROL REG.

Removes Objectionable Smells in White Spirit, Turpentine, Substitutes, Lubricating and Fuel Oils, Greases, Distempers, Glues, Etc
CREPIN & DOUMIN, LTD.
15, COOPERS ROW, E.C.3.

Disinfectants

ALL GRADES, PERCENTAGES AND CO-EFFICIENTS
ALSO
LIQUID SOAPS
W. GARDINER & CO.
83, Broad Street, Camlachie, Glasgow

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JOHN FEAVER,
TOWER BRIDGE ROAD, S.E.1.
TINS for
PRESERVED PROVISIONS and FOODSTUFFS.
CANS for VARNISH PAINT.
DRUMS & TAPERS for OILS, VARNISH.
Samples and Prices on Application.

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EVAPORATORS
ACID ELEVATORS
FANS
EXTRACTORS
CRYSTALLIZERS

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DISTILLING PLANT.
DRYING PLANT OIL HARDENING PLANT.
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